

MACHINERY

DESIGN — CONSTRUCTION — OPERATION

Volume 36

OCTOBER, 1929

Number 2

PRINCIPAL ARTICLES IN THIS NUMBER

Second National Machine Tool Exposition.....	81
New Shop Equipment to be Seen at the Show	85
Special Machine Cuts Time from Weeks to Days.....	120-M
Current Editorial Comment.....	120-X
Apprentice Training is a Joint Responsibility—Allowances on Castings and Forgings—An Increase in Overhead may Reduce Costs	
The Need for Skilled Workmen in Industry— <i>By Harold C. Smith</i>	121
What the Master Tools of Industry Produce	124
Applications of Portable Electric Tools.....	126
Ingenious Mechanical Movements.....	128
Special Tools and Devices for Railway Shops	131
Use of Concrete in Machine Construction— <i>By Charles B. Irmer</i>	134
How Plymouth Axle Housings are Finished— <i>By Charles O. Herb</i>	137
Planning and Tooling Up for New Work— <i>By Svend J. Helweg</i>	143
How do Successful Foremen Handle Men?	153
An Electrically-controlled Gear Shift— <i>By Frederick A. Pearson</i>	155
Steel Treaters Discuss Important Problems	159
Possibilities of High-strength Cast Iron— <i>By E. J. Lowry</i>	162
Announcement of Prize Contest.....	163

DEPARTMENTS

New Machinery and Shop Equipment.....	120-O
What MACHINERY'S Readers Think.....	130
Notes and Comment on Engineering Topics.....	133
Letters on Practical Subjects.....	147
Shop and Drafting-room Kinks.....	161

Total Distribution for September, 17,067 Copies

Product Index 424-446

Advertisers Index 449-450

PUBLISHED MONTHLY BY

THE INDUSTRIAL PRESS, 140-148 LAFAYETTE STREET, NEW YORK

ALEXANDER LUCHARS, President

ROBERT B. LUCHARS, Vice-President

EDGAR A. BECKER, Treasurer

JOHN OBERG, Editor

FRANKLIN D. JONES, Associate Editor

CHARLES O. HERB, Assistant Editor

FREEMAN C. DUSTON, Assistant Editor

LONDON: 52 Chancery Lane

PARIS: 15 Rue Bleue

YEARLY SUBSCRIPTION: United States and Canada, \$3 (two years, \$5); foreign countries, \$6. Single copies, 35 cents.

Copyright 1929 by The Industrial Press. Entered as second-class mail matter, September, 1894, at the Post Office in New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America.



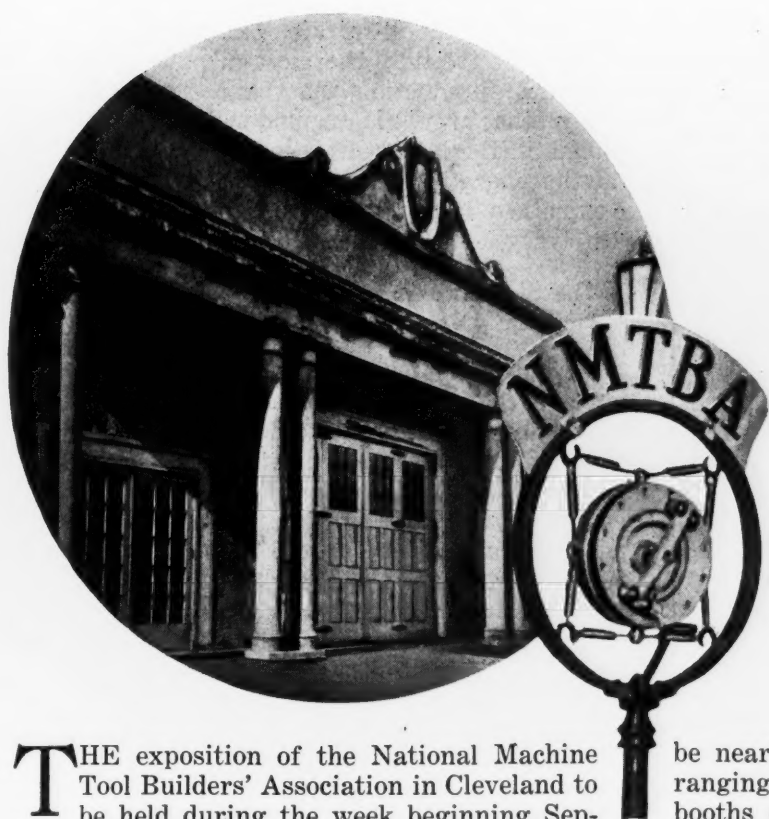
At Cleveland
September 30th
to October 4th

MACHINERY'S
Booth at the Big Show

1-E-1

Full staff in attendance.
If we can give you any
information, serve
you in any way,

Come and
see us



The Second National Machine Tool Exposition

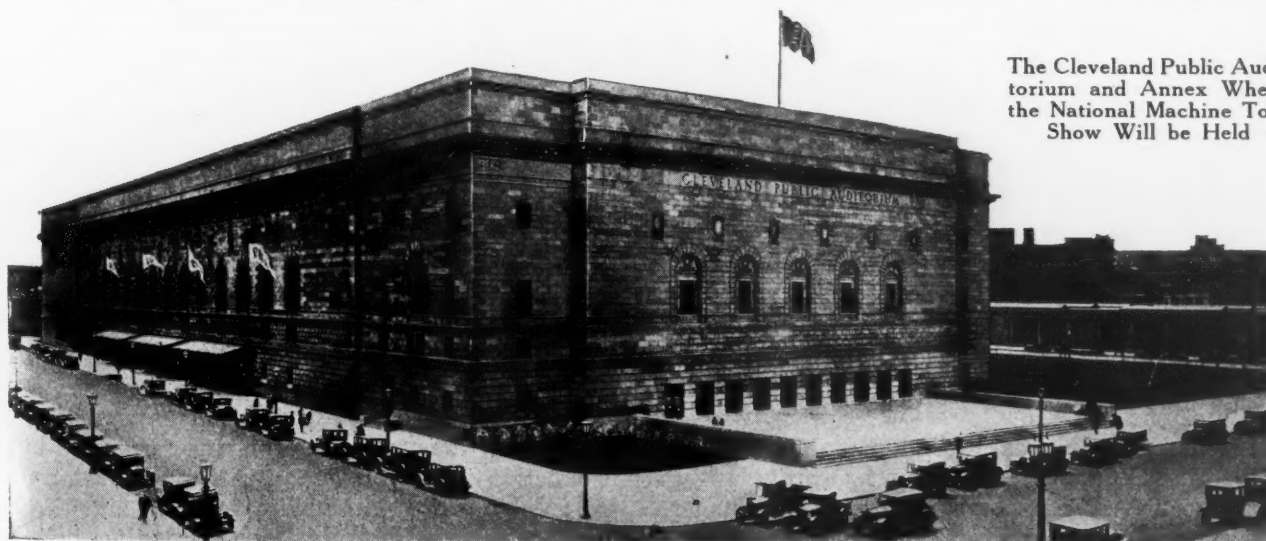
The National Machine Tool Builders' Exposition, to be Held in Cleveland, September 30-October 4, is an Event of the Greatest Importance to the Machine-building and Metal-working Industries of the Entire World

THE exposition of the National Machine Tool Builders' Association in Cleveland to be held during the week beginning September 30, marks a milestone in the history of the machine-building and metal-working industries, not only of the United States, but of the world; for at that exposition will be assembled the latest and most ingenious means for obtaining high production and accuracy in machine-shop operation. It is an event of the greatest importance to everyone engaged in the industries that make use of machine tools and accessories; and it is because of this great importance that MACHINERY is devoting considerable space in this number to illustrated descriptions of the new machines and tools that will be featured at the exposition.

The show will occupy the Arena, Arcade, and West Annex of the Public Auditorium in Cleveland, and will comprise the most complete range of machine tools, shop equipment, and accessories that has ever been assembled in one place. There will

be nearly 250 separate exhibits, occupying areas ranging from 3000 square feet down to exhibition booths of more moderate size. Several hundred individual machine tools and thousands of small metal-cutting tools and accessories will be on display. Of the machine tools, considerably more than one hundred are new designs that have not previously been shown to executives in the machine-shop field. Practically all of the machines will be in operation, and the show, which may be truly termed "The Best-equipped Machine Shop in the World," will require about 5000 horsepower to drive the machines that will be engaged in the regular metal-cutting operations for which they have been designed.

The 1927 exposition of the National Machine Tool Builders' Association held in the same buildings in Cleveland, was acknowledged to be a great success, but it will be conspicuously surpassed by the present show, both in number of machines and tools to be exhibited, and in the area occupied by



The Cleveland Public Auditorium and Annex Where the National Machine Tool Show Will be Held



Members of the Exposition Committee



J. WALLACE CARREL
Vice-president
and General Manager,
Lodge & Shipley
Machine Tool Co.
Chairman of the
Committee

ROBERT M. GAYLORD
President,
Ingersoll Milling
Machine Co.



RALPH E. FLANDERS
Manager,
Jones & Lamson
Machine Co.

JAMES E. GLEASON
President,
Gleason Works



P. E. BLISS
President,
Warner & Swasey Co.

the exhibits, which will be more than twenty-five per cent greater than that necessary for the exhibits of the last show.

In planning this exposition, the National Machine Tool Builders' Association has provided general executives, engineers, production managers, superintendents, and foremen in the machine-

building and metal-working industries with an opportunity to study the most advanced means in economical production that cannot be duplicated in any other way. Here, under one roof, may be studied all the latest advances in shop equipment; and the operation of the machines and tools will be explained by men in attendance who are familiar with every detail of their construction.

The Standard Machine Tool Color Will Add Attractiveness to the Show

The machine tool builders have just adopted a standard color for the finishing of machine tools to be known as "Standard Machine Tool Gray." The machine tools on exhibition at Cleveland will practically all be finished in this newly adopted gray—a soft dark shade, pleasing to the eye and practical for the purpose for which it is used. The visitors to the show, for the first time in the history of any machinery or equipment exposition, will find the long lines of machine tools all painted in the same color and all having the same degree of gloss. Not only will the exposition hall be the best-equipped machine shop in the world, but, in addition, it will be a machine shop of harmonious appearance, keyed to production.

Some of the New Machines that the Visitor to the Show will have an Opportunity to Inspect

It is not intended here to try to enumerate all the new machines and special features with which the machine shop executives visiting the show will have an opportunity to acquaint themselves, but it may be of interest to mention briefly a few of the new machines that will be on exhibition. More detailed descriptions of most of these will be found in the following pages of this number of *MACHINERY*. The power and speed required for the full utilization of the high-speed cutting materials recently introduced will be found in many types. In the milling and grinding machine fields, as well as in automatic turning equipment, there will be several innovations. Broaching machines embodying new ideas will be featured, and hydraulic feeds will be seen applied to machines that have not been so equipped in the past.

A few of the specific machines to be shown are as follows: A spiral bevel-gear generator embodying a new form of reversing mechanism which permits of very high speeds with small shock; a hobbing machine designed for high production, for roughing and finishing spur gears and splined shafts; a gear-tooth lapping machine intended to correct the shape of the teeth of hardened gears; a hob-sharpening machine for the faces of all types of hob teeth, which may also be used on form-cutters; a rotary continuous milling machine with a rail-mounted two-spindle head for roughing, and a single-spindle head for finishing, and with quill adjustment to compensate for cutter wear; a high-production drilling machine with push-button control; an improved automatic forming and threading machine for pointing and threading bolts; a



planer-type shaper having both feed and table action hydraulically operated; a high-speed sensitive drilling machine designed for use with tools made from the new cutting alloys (this machine will be shown in operation, using drills pointed with several kinds of the new cutting metals).

These are but a few of the many "high lights" in machine tool construction that will be of interest to visitors. In every branch of the machine tool industry new equipment will be on exhibition, in many instances with radical improvements over past designs.

**The Sessions of the Machine Tool Congress
will Further Enhance the Value of a
Visit to the Exposition**

During the week of the exposition, after the show hours, which are from nine o'clock in the morning to six o'clock at night each day, from Monday, September 30, to Friday, October 4, inclusive, the Machine Tool Congress, under the direction of a joint committee of the Production Division of the Society of Automotive Engineers and the Machine Shop Division of the American Society of Mechanical Engineers, will hold meetings.

The program of the Congress consists of four evening sessions and a dinner. The subjects for the sessions will be as follows: Monday, "What Information Does the Machine Tool Buyer Need from the Machine Tool Salesman?", by George T. Trundle, Jr., president, Trundle Engineering Co., Cleveland, Ohio; Tuesday, "Present Status of Cemented Tungsten-Carbide Tools and Dies," by Dr. Zay Jeffries, General Electric Co.; Wednesday, "Economic Production Quantities," by Professor F. E. Raymond of the Massachusetts Institute of Technology; Thursday, Round-table discussion on the application of standard machine tools to automobile manufacture, results in production obtained from new features in machine tools, synchronizing automobile part production with the assembly line, and a basis of replacing machine equipment.

Everyone who attends the exposition is also privileged to attend the meetings of the Machine Tool Congress and to take part in the discussions. The meetings will be held at the Hotel Cleveland, just two blocks away from the exposition hall.

**Cleveland—the Exposition City—is a
Center of Great Industries**

It is most fitting that Cleveland should again have been selected as the place for this great Machine Tool Exposition, located as it is in the very center of the industrial area of the United States. Half of the population of the United States and Canada lives within a radius of 500 miles of the exposition city, and it may be reached from almost every other large industrial center in the country over night.

Within the boundaries of Cleveland there are more than 3000 industrial plants manu-

facturing annually more than \$1,000,000,000 worth of products. The value of the annual output of the machine shop and foundry industries of Cleveland alone amounts to over \$150,000,000. In addition, automobiles and automotive parts are manufactured to a value exceeding this figure.

It seems of particular interest to note in this connection that Cleveland was first laid out in 1796 by Moses Cleaveland, who in that year set out from Old Wyndham, Conn., to survey a tract of land in northern Ohio and who laid out the site of the city, a mile square. Little did he dream that he was planning one of the large cities of the world with an estimated population today, including suburbs, of over 1,200,000 people. Probably he thought that his imagination was carrying him rather far afield when he returned to Connecticut and said "I believe that the new town that I have surveyed will some day be as large as Old Wyndham."

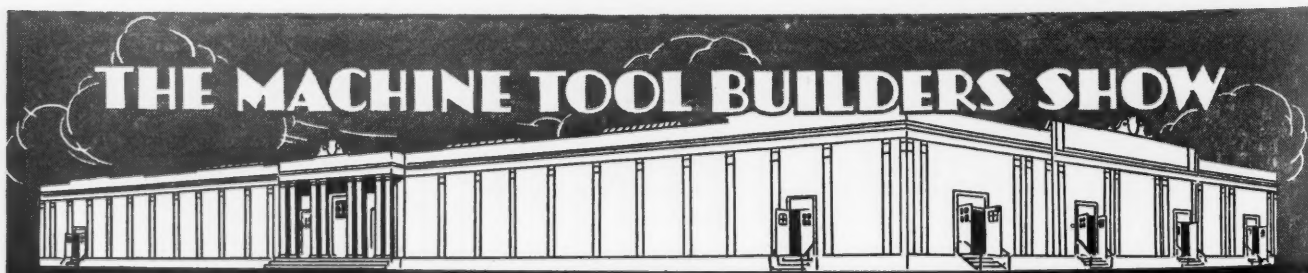
The Public Square in
Cleveland with the New
Union Station





List of Exhibitors

Name of Firm	Booth No.	Name of Firm	Booth No.	Name of Firm	Booth No.
Abrasive Machine Tool Co.	2W-5	Fosdick Machine Tool Co.	1A-3	National Acme Co.	1B-5
Acme Machine Tool Co.	2B-14	Foster Machine Co.	2C-2	National Automatic Tool Co.	1D-1
Acme Machinery Co.	2D-5	Fredericksen Co.	5W-6	National Machinery Co.	1A-8
Ahlberg Bearing Co.	4W-10	Frew Machine Co.	3W-16	National Twist Drill & Tool Co.	4B-5
Chas. G. Allen Co.	1W-11	Gairing Tool Co.	4B-2	New Britain-Gridley Mach. Co.	2A-3, 2W-26
Allis-Chalmers Mfg. Co.	5C-11	Gallmeyer & Livingston Co.	2B-15	New Departure Mfg. Co.	5W-5
American Broach & Machine Co.	1W-22	Gardner Machine Co.	1W-20	Niagara Machine & Tool Works	3W-20
American Machinist	1E-2	W. Gaterman Mfg. Co.	5C-2A	Noble & Westbrook Mfg. Co.	5W-3
American Tool Works Co.	2D-3	Gears & Forgings, Inc.	3W-15	Norma-Hoffman Bearings Corp.	4W-4
Armstrong Bros. Tool Co.	4C-2	General Electric Co.	4A-2	Norton Co.	2A-10
Armstrong-Blum Mfg. Co.	4A-5	General Radial Drill Co.	2W-14	Niles-Bement-Pond Co.	2D-9
Arter Grinding Machine Co.	1W-8	Geometric Tool Co.	1W-21	Oakite Products, Inc.	4W-1
Associated Machine Tool Dealers	2W-0	Giddings & Lewis Machine Tool Co.	2C-11	Oesterlein Machine Co.	1A-13
E. C. Atkins & Co.	5C-6	Gisholt Machine Co.	1C-4	Ohio Machine Tool Co.	2D-8
Automatic Nut-Thread Corp.	3W-2	Gits Bros. Mfg. Co.	5A-8	Oilgear Co.	2A-5
Automotive Industries	4W-7	Gleason Works	1B-4	O. K. Tool Co., Inc.	4B-7
Avey Drilling Machine Co.	1A-6	Goddard & Goddard Co., Inc.	3W-13	Oliver Instrument Co.	1W-6
Baker Bros.	2B-13	Goss & De Leeuw Machine Co.	1B-3	Oster Mfg. Co.	3W-17
Baker-Raulang Co.	4W-6	Gould & Eberhardt	1B-6	Peerless Machine Co.	1A-11
Barber-Colman Co.	1C-2	Greenfield Tap & Die Corp.	3W-8	Penton Publishing Co.	5W-9
W. F. & John Barnes Co.	2B-9	Greenlee Bros. & Co.	1B-2	Porter Cable Machine Co.	1W-19
Barnes Drill Co.	2D-4	Hall Planetary Co.	2W-11	Potter & Johnston Machine Co.	3W-6
Leon J. Barrett Co.	1W-13	Hammond Manufacturing Co.	5A-2	Pratt & Whitney Co.	2D-1
John Bath & Co.	5W-1	Hanna Engineering Works	3W-10	Producto Machine Co.	1W-14
Bausch & Lomb Optical Co.	6A-5	Hannifin Mfg. Co.	5B-9	Thomas Prosser & Son	4C-6
Charles H. Besly and Co.	2D-6	Hanson-Whitney Machine Co.	2B-6	O-C Engineering & Tool Sales, Inc.	4A-6
Biax Flexible Shaft Co.	5A-6	Hardinge Bros., Inc.	2W-7	Racine Tool & Machine Co.	2W-20
Black & Decker Mfg. Co.	4B-1	Heald Machine Co.	2A-7	Ramsey Chain Co., Inc.	4W-3
G. S. Blakeslee & Co.	4C-3	Hendey Machine Co.	1D-2	Reed-Prentice Corporation	2W-2-3
Blanchard Machine Co.	1W-5	Henry & Wright Mfg. Co.	2W-4	Reliance Elec. & Eng. Co.	6A-6
J. G. Blount Co.	1W-2	Hixley Machine Co.	2W-9	Rickert-Shafer Co.	2C-10
Bowen Products Corporation	5A-7	Hill-Curtis Co.	2W-8	Rivett Lathe & Grinder Corp.	5B-5
Boye & Emmes Machine Tool Co.	3W-7	Hisey-Wolf Machine Co.	2W-22	Rockford Drilling Machine Co.	2W-25
Bradford Machine Tool Co.	2A-4	Hoefer Mfg. Co.	2W-1	Rockford Machine Tool Co.	2B-3
Bridgeport Safety Emery Wheel Co.	1A-5	E. F. Houghton & Co.	6B-4	Ross Mfg. Co.	4W-9
Brown & Sharpe Mfg. Co.	2C-8	Hyatt Roller Bearing Co.	5A-5	Rotor Air Tool Co.	5B-8
Bryant Chucking Grinder Co.	2B-12	Hydraulic Press Mfg. Co.	3W-4	Joseph T. Ryerson & Son, Inc.	2D-2
Buckeye Portable Tool Co.	4A-1	Illinois Tool Works	5C-1	Safety Grinding Wheel & Machine Co.	2B-10
Buffalo Forge Co.	1A-4	Ingersoll Milling Machine Co.	1C-1	Sebastian Lathe Co.	1W-24
Buhr Machine Tool Co.	2D-7	International Machine Tool Co.	1W-16	Wm. Sellers & Co., Inc.	2A-6
Bullard Co.	1B-1	Iron Age Publishing Co.	5W-6A	Seneca Falls Machine Co.	1A-9
Canadian Machinery	5C-7	Jones & Lamson Machine Co.	1A-10, 2C-6	Sidney Machine Tool Co.	2W-6
Candey-Otto Mfg. Co.	5C-10	Kane & Roach, Inc.	3W-14	Siewek Tool & Die Co.	6A-3
Carboloy Co., Inc.	4A-2	Kearney & Trecker Corporation	2B-7	Simonds Saw & Steel Co.	4B-4
Carlton Machine Tool Co.	2B-2	Keller Mechanical Engineering Corp.	2C-3	S K F Industries, Inc.	4W-12
Chicago Belting Co.	5W-7	Kelly Reamer Co.	5W-12-13	Skinner Chuck Co.	4W-13
Chisholm-Moore Hoist Corp.	6B-6	Kempsmith Mfg. Co.	1B-7	Sleeper & Hartley, Inc.	5A-1
Cincinnati Bickford Tool Co.	2A-1	Kent Machine Co.	5A-1A	Smith & Mills Co.	2W-19
Cincinnati Grinders Corp.	2C-7	Keystone Lubricating Co.	6A-2	Springfield Machine Tool Co.	1W-7
Cincinnati Lathe & Tool Co.	2W-18	King Machine Tool Co.	1A-2	Standard Electrical Tool Co.	4C-4
Cincinnati Milling Machine Co.	2C-7	Kingsbury Machine Tool Corp.	2W-10	Standard Steel Specialty Co.	5C-5
Cincinnati Shaper Co.	2W-17	W. B. Knight Machinery Co.	1W-10	Standard Tool Co.	5W-2
Cleveland Automatic Machine Co.	2C-5	William Laidlaw, Inc.	5B-3	Stark Tool Co.	1W-23
Cleveland Hobbing Machine Co.	1A-10A	Landis Machine Co.	1B-8	L. S. Starrett Co.	5W-8
Cleveland Planer Co.	1C-3	Landis Tool Co.	1W-18	Stockbridge Machine Co.	1W-13
Cleveland Twist Drill Co.	4W-11	LaSalle Tool Co.	3W-12	D. A. Stuart & Co., Inc.	4W-5
Cochrane-Bly Co.	2C-12	R. K. LeBlond Machine Tool Co.	2C-1	Sundstrand Machine Tool Co.	1A-7
Colonial Tool Co.	5A-4	Lees-Bradner Co.	3W-1	Sun Oil Co.	4A-4
Columbia Machine Tool Co.	2W-15	Lehmann Machine Co.	2W-24	Superior Machine Tool Co.	3W-18
Conradson Tool Corp.	4A-3	Leland-Gifford Co.	2B-1	Swift Welder Co.	2D-8
Consolidated Machine Tool Corp.	2C-4	Lincoln Electric Co.	5A-3	Taft-Peirce Mfg. Co.	3W-11
Covel-Hanchett Co.	2A-9	Link-Belt Co.	4C-1	Taylor & Fenn Co.	2A-3A
Cushman Chuck Co.	5B-2	Lodge & Shirley Machine Tool Co.	2B-11	Thompson Grinder Co.	2W-13
Cutler-Hammer, Inc.	6A-1	Logansport Machine Co.	1W-9	Timken Roller Bearing Co.	4W-2
Danly Machine Specialties	4B-6	Lucas Machine Tool Co.	1W-17	Tite Flex Metal Hose Co.	5B-7
DeVlieg Machine Tool Co.	2A-2	Ludlum Steel Co.	6A-4	Torrington Co.	1W-1
DeWalt Products Corp.	6B-5	Machinery	1E-1	Tuthill Pump Co.	5C-3
Diamond Machine Co.	2A-8	Madison-Kipp Corporation	5W-11	Twin Disc Clutch Co.	4W-15
Henry Disston & Sons, Inc.	4B-8	Manning, Maxwell & Moore, Inc.	2B-5	Union Mfg. Co.	5C-8
Dresses Machine Tool Co.	2W-12	Marlin-Rockwell Corporation	4W-14	U. S. Electrical Tool Co.	1A-15
Eastern Machine Screw Corp.	1W-3	Marschke Mfg. Co.	4B-1	Universal Boring Machine Co.	2B-4
Eclipse Interch. Counterbore Co.	5B-4	McCrosky Tool Corporation	5W-14	Van Dorn Electric Tool Co.	4B-3
Economy Engineering Co.	1W-15	Michigan Tool Co.	5A-4	Van Norman Machine Tool Co.	1A-14
Elwell-Parker Electric Co.	6B-1-2	Mill & Factory Illustrated	5C-2	O. S. Walker Co., Inc.	2W-8A
Ex-Cell-O Tool & Mfg. Co.	5A-9	Modern Machine Shop	4W-8	Warner & Swasey Co.	1A-1
Fafnir Bearing Co.	5W-10	Modern Machine Tool Co.	5B-6	Westinghouse Elec. & Mfg. Co.	5B-1
Fairbanks Morse & Co.	5C-9	Moline Tool Co.	2C-9	Whitney Mfg. Co.	2B-6
Farrel-Birmingham Co., Inc.	3W-5	Monarch Machine Tool Co.	2W-21	Whitney Metal Tool Co.	2W-16
Fellows Gear Shaper Co.	2B-8	Morse Chain Co.	5W-10A	Williams Tool Corporation	3W-3
Flather Co.	1W-4	Morton Mfg. Co.	3W-19	Wisconsin Electric Co.	5C-4
Foley Saw Tool Co., Inc.	6B-3	Murphy Machine & Tool Co.	2W-23	Yale & Towne Mfg. Co.	4C-5
Foot-Burt Co.	1A-12				





This Section Includes Only Machines and Tools that Have not Been Previously Described

GOSS & DE LEEUW WORK-ROTATING MULTIPLE-SPINDLE CHUCKING MACHINE

Booth No. 1-B-3

Four horizontal work-spindles are positioned 90 degrees apart radially in a horizontal turret, and present work-pieces to three sets of tools for simultaneous operation in a new type of chucking machine to be exhibited by the Goss & DeLeeuw Machine Co., New Britain, Conn. The work is reloaded in the front position, each chuck being stopped and started in that position by operating the lever above it, as illustrated in Fig. 1. This lever controls the driving gear of the corresponding work-spindle and has three positions. The spindle is stopped by moving the lever into a neu-

tral position. After reloading, the lever is raised to engage a friction cone for picking up the initial load, and then dropped to engage a clutch which gives a positive spindle drive.



Fig. 1. Goss & De Leeuw Chucking Machine Having Large Work Turret that Indexes in a Horizontal Plane

The work-spindles are driven by the main motor seen at the right in Fig. 2, the mechanism being designed for transmitting 25 horsepower. The power is transmitted through a silent chain, back-gears, quick-change gears and bevel gears to a shaft in the center of the turret. From this point it is carried through spur and bevel gears to the respective spindles. All four work-spindles revolve at the same speed, a 2 to 1 back-gear furnishing a fast or slow speed for each combination of the quick-change gears. Spindle speeds are available from 16 to 525 revolutions per minute.

A 5-horsepower motor at the extreme left in Fig. 2, furnishes power for indexing the turret, and for feeding the main

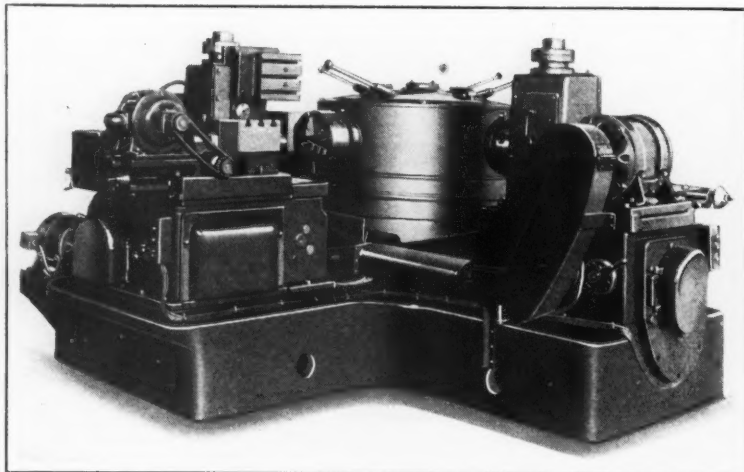


Fig. 2. Work-rotating Chucking Machine as Seen from the Rear

and cross tool-slides. Fig. 2 also shows a third motor which drives a revolving tool-spindle attachment. This unit can be placed on any one or on all of the three main tool-slides. Its spindle can be revolved at different speeds, which, in conjunction with the revolving work-spindles, gives a wide range of cutting speeds. This attachment also facilitates the drilling of holes true and straight.

All three motors are connected to one control box. Push-buttons are so located that the machine can be conveniently started, stopped, or jogged from any tool position. Threading, either internal or external, is done by the regular Goss & De Leeuw lead-screw method, employing a reversing motor.

Indexing of the heavy turret is accomplished by employing an unusual adaptation of the Geneva double movement. Two rollers enter the Geneva slots, one after the other, each moving the turret through 45 degrees. A heavy bolt operated by compressed air locates the turret in its indexed positions. Differential pistons in this cylinder produce a pressure of 2500 pounds for moving the bolt. The valve which governs the movement of these pistons is controlled by a cam on the outer edge of the Geneva wheel. After the bolt is in place, the turret is locked in position by a large-diameter clamping ring which bears on two opposite 45-degree sections.

Both the main and cross tool-slides are actuated by barrel track cams. By combining the movements of the main and cross slides, heavy taper turning and forming cuts can be taken. The standard plain slide at the right in Fig. 1, carries a heavy tool-block with T-slots in its upper face. This block is also bored to take boring-bars or tool-holders and the side faces can be drilled and tapped to permit bolting special tool-heads on them. The cross-slides also have T-slots.

All slide feeds can be started and stopped by operating the small lever at the right in the group of three, shown at the front of the machine. The square-head shaft at the top of the group can be turned with a wrench for operating the machine by hand, while the lever at the left trips the indexing mechanism, but only after all tool-slides have been withdrawn from the work.

Lubrication has been given careful consideration in designing the machine. All of the spindles and the working parts within the turret are lubricated by a wick-feed system which indexes with the turret. Other moving parts outside of the turret are lubricated by a mechanical oiler at the back of the machine which forces oil to each bearing through a separate pipe. This oiler is driven by a chain connected to the feed-and-index drive motor. Each chuck is furnished with an Alemite connection for lubricating the scroll and other moving parts. A pump supplies coolant to the work pieces.

Chucks up to 20 inches in diameter can be accommodated. The machine weighs approximately 13 tons.

NORTON GRINDING AND LAPPING MACHINES

Booth No. 2-A-10

Three new machines to be exhibited by the Norton Co., Worcester, Mass., include the double-head crankpin grinding machine shown in Fig. 1, the type A cyl-

indrical grinding machine in Fig. 2, and the crankshaft lapping machine in Fig. 3. The crankpin grinding machine has been designed with the view of

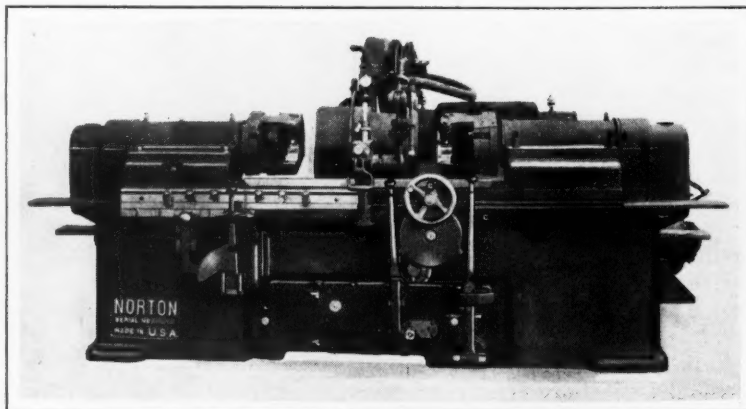


Fig. 1. Norton Double-head Crankpin Grinding Machine with Hydraulic Control



providing maximum safety of the operator and minimum manual effort. The work-holders, table, and wheel-slide are hydraulically operated. By the use of an interlocking device, these mechanisms are so controlled that none of them can be moved while any of the others are in operation. This insures safety to the operator and the prevention of spoiled work.

The steadyrest is so designed that it moves upward when unclamped from the table, so as to permit easy access to the work. This upward movement also stops the flow of lubricant. A Pratt gage attached to the steadyrest and splash guards, moves in and out of the operating position with the steadyrest. These features make it unnecessary to lift the work over the steadyrest when reloading.

The work-holder spindles are driven in synchronism by two silent chains. The right-hand work-head is stationary, while the left-hand head is provided with a lateral adjustment to obtain proper alignment of the crankshaft. The work is firmly held in place by hydraulically-operated clamps which will not release if the hydraulic mechanism fails. Locators on the work-holders control the angular and endwise location of the crankpins. A spacing bar and dogs, with positioning slots, locate the work table lengthwise for grinding each crankpin. A hand feed is employed in grind-

ing to size. The machine may be set for grinding a crankshaft with 4, 6 or 8 crankpins. This machine will swing work 17 inches in diameter and is made in six sizes, ranging from the 24- to 30-inch size up to the 54- to 60-inch size.

On the 10- by 24-inch type A cylindrical grinding machine, shown in Fig. 2, the wheel slide is traversed hydraulically. Fast motion from the extreme rear position to a predetermined spot close to the grinding position is obtained by moving a convenient control lever. The grinding operation is performed by a hand feed. A fast return motion to

the extreme rear position is obtained by moving the control lever backward.

One of the principal improvements on the type 50 crankshaft lapping machine shown in Fig. 3, is a mechanically elevated table for raising the work to the grinding position and lowering it to facilitate removal when the grinding operation is completed. The lapping time is also mechanically controlled. This mechanism can be set to lap for a specified time and then to stop. The arrangement facilitates uniformity of finish. The lapping arms are counterbalanced and suspended vertically so that their weight has no influence on the lapping.

The machine is designed to lap all main bearings and crankpins simultaneously, and has a capacity for handling crankshafts up to 42 inches in length. Abrasive paper, cast-iron laps with loose abrasive, or abrasive sticks may be used. The machine is fully equipped with ball and roller bearings.

CINCINNATI GEAR BURNISHER

Booth No. 2-W-17

The gear burnisher illustrated was brought out by the Cincinnati Shaper Co., Elam St. and Garrard Ave., Cincinnati, Ohio, to handle gears up to 12 inches



Fig. 3. Crankshaft Lapping Machine which Simultaneously Laps All Crankpins and Main Bearings

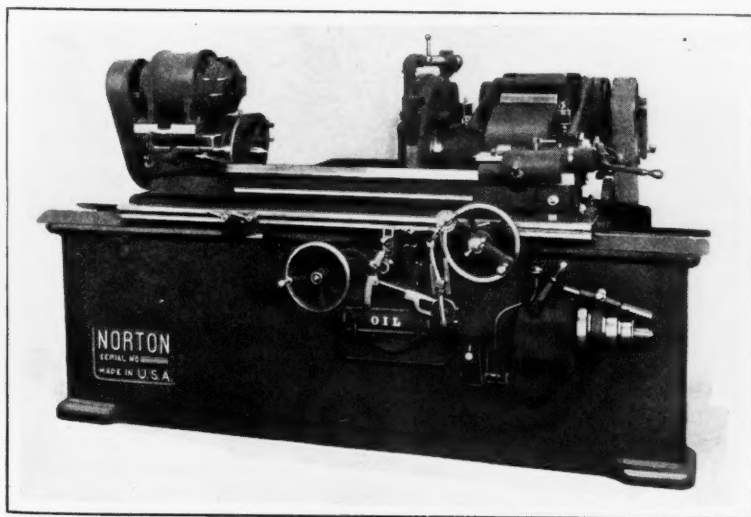
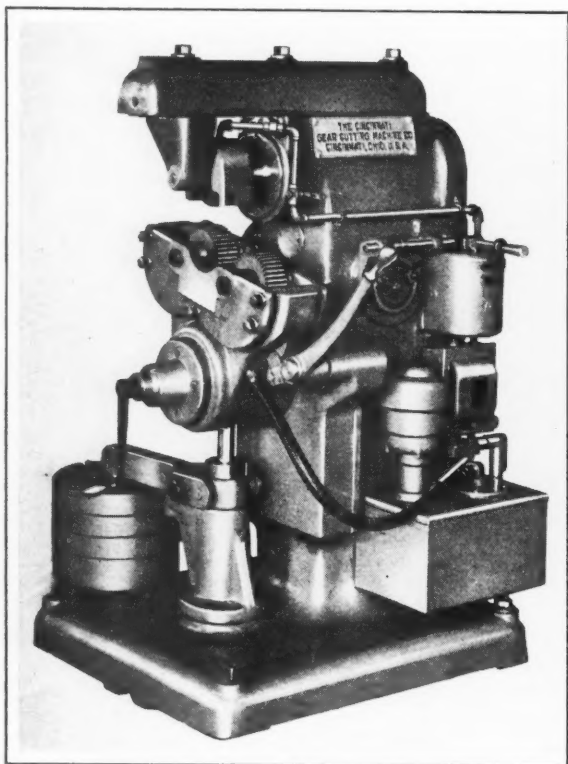
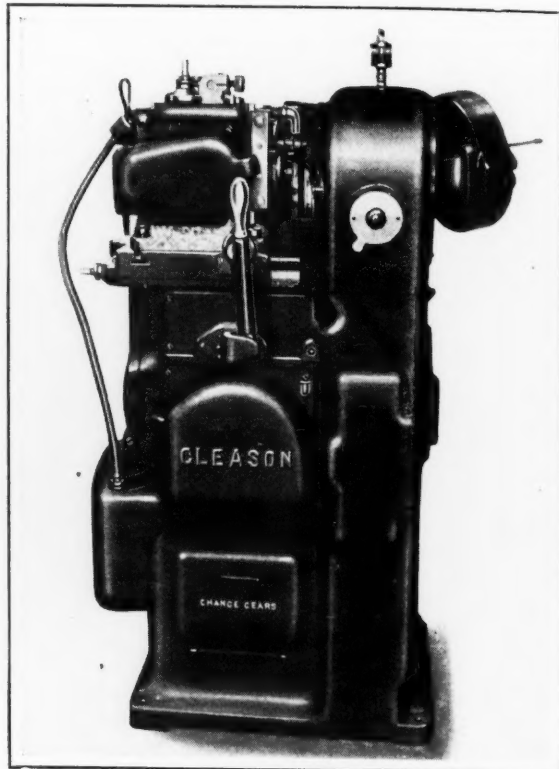


Fig. 2. Cylindrical Grinder with Hydraulic Wheel-slide Traverse



Cincinnati Gear Burnisher with Counterweights for Exerting Pressure on the Burnishing Gears



Gleason Spiral-bevel Gear Generator for Gears up to 3 3/8 Inches in Pitch Diameter

in diameter, and can be arranged for larger gears, whereas previous machines built by the concern handled gears up to 7 inches in diameter, only. One of the special features of the new machine is that the pressure with which the burnishing gears engage the "green" gear, or the gear to be burnished, is fixed by means of counterweights which permit a movement of the carriage slide sufficient to compensate for any small variations in the pitch diameter of a run of gears.

The operation of the machine is entirely automatic. After placing the "green" gear in position between the master gears, the operator pushes a lever which causes the master gears to be brought into engagement with the gear to be burnished, and then he throws the starting switch. The spindle makes a predetermined number of revolutions in one direction and the same number in the reverse direction and then stops automatically. The burnishing time can be varied from 5 to 6 seconds up to 30 seconds or more.

GLEASON SPIRAL-BEVEL GEAR GENERATOR

Booth No. 1-B-4

Gears up to 3 3/8 inches in pitch diameter, 1/2 inch in face width and with a 1 3/4-inch cone distance at a 4 to 1 ratio, can be handled by a small-size spiral-bevel gear generator just brought out by the Gleason Works, 1000 University Ave., Rochester, N. Y. The largest pitch angle that can be cut on gears mounted at right angles is 75 degrees 58 minutes, and the smallest, 14 degrees 2 minutes. The finest pitch that can be cut is limited only by the point width of the cutter. This machine employs the generating principle of Gleason bevel-gear generators in which the work and cutter are rolled relative to each other during the cut in the manner of a gear meshing with a crown gear.

Cutters of the face-mill type are used with the blades integral with the head. These cutters are made in four standard diameters of 0.5, 1.1, 1.5 and 2 inches, and all have four blades, with the exception of the 0.5-inch size, which has two. The cutters are

made with alternate inside and outside cutting blades so that both sides of a tooth slot are cut simultaneously.

The cutter-spindle is adjustable vertically and horizontally for setting the cutter to any desired spiral angle and to permit cutting the teeth of both right- and left-hand gears. An angular adjustment is also provided in a vertical plane by means of which it is possible to modify the tooth bearing of gears and to often use one cutter for a range of work. All adjustments are facilitated by graduated scales and dials equipped with micrometer screws.

A particular feature of the machine is a quick throw-out mechanism which enables the cutter-slide to be moved instantaneously to or from the cutting position, by simply moving a lever. The machine is driven by two 1/4-horsepower built-in motors. One of them drives the cutter-spindle through a set of speed-change gears, while the



other furnishes power to the main drive shaft through a set of feed-change gears. The cutter-drive motor is equipped with a reversing switch so that the direction of cutter rotation can be changed to suit the hand of cutter used.

A companion machine to the

one just described, has been built for producing straight bevel gears. The main difference between it and the spiral-bevel gear generator is that two reciprocating tools are employed instead of circular-type cutters. This machine will also be shown at the Exposition.

"LO-SWING" PISTON-TURNING AUTOMATIC

Booth No. 1-A-9

The "Lo-Swing" model U automatic lathe built by the Seneca Falls Machine Co., Seneca Falls, N. Y., which was described in June, 1929, *MACHINERY*, page 785, has been equipped with automatic loading and clamping means for turning and grooving automobile pistons, as shown in the accompanying illustrations. The equipment can also be adapted for turning other comparatively short cylindrical work.

The piston machine is completely automatic in that no operator is required either for placing the work in the operating position or for removing it. A push-button starts the machine, which will then continue to perform its work without attention until stopped. All that is necessary is to place the pistons on a runway, which is done by the operator performing the previous operation on them.

The piston is automatically picked up from the runway and placed in the operating position, where it is held between a pneumatically operated tail-center and a dowel center fitting the open end of the piston; the latter is then driven by the bosses on the inside. There is one tool-holding slide on each side of the machine. The front slide, which moves in a direction parallel with the axis of the piston, holds the piston-turning tools; the rear slide carries the tools for grooving, facing, and forming. When these operations have been performed, the piston is automatically removed and deposited on a runway which carries it to the next machine. Simultaneously with the removal of one piston from the machining position another piston is automatically taken from the incoming runway and placed in the working position.

The loading and unloading mechanism of the tailstock center is pneumatically operated and controlled by adjustable cams operating pneumatic valves. As seen in the illustrations, the machine is provided with two sets of gripping fingers designed to have much the same action as the human hand. These "hands" are also pneumatically controlled. Fig. 1 shows one hand gripping a new piston, while the other is ready to remove the finished piston from the operating position. Fig. 2 shows the new piston placed in the operating position, while the finished piston is being delivered to the runway. The two hands operate simultaneously. The approximate time from the moment that the tools have finished their work, until they start to cut on the next piston is $3\frac{1}{2}$ seconds.

In the first rough-turning operation on pistons made from aluminum alloys, a production of 120 per hour has been regularly obtained. The machine occupies a floor space of only $3\frac{1}{2}$ by 6 feet, but being of very heavy construction, weighs about 5000 pounds. The object of the heavy design is to enable the machine, if necessary, to take advantage of the cutting capacity of the newly developed high-production cutting alloys.

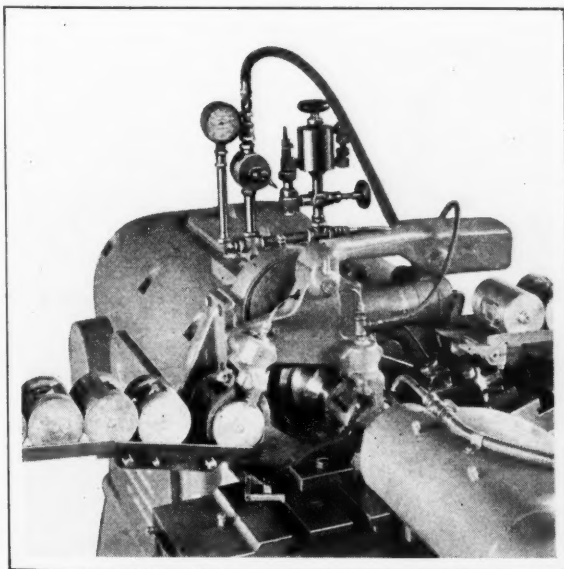


Fig. 1. "Lo-Swing" Piston-turning Automatic Showing One "Hand" Gripping a New Piston While the Other is Ready to Remove the Finished Piston

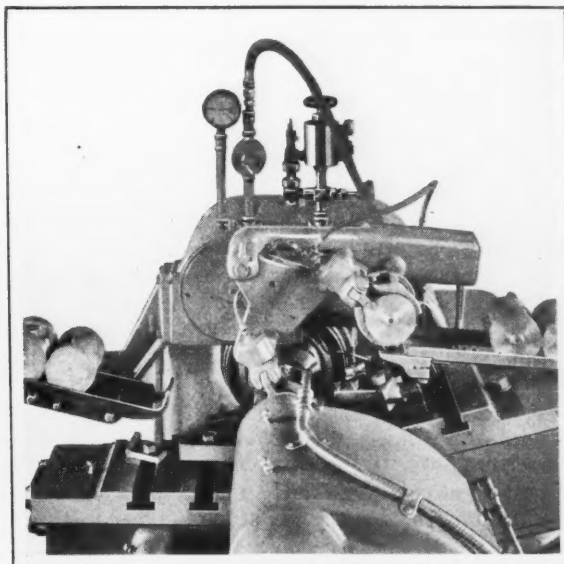


Fig. 2. New Piston being Placed in Operating Position While the Finished Piston is being Delivered by the Gripping Fingers to the Runway

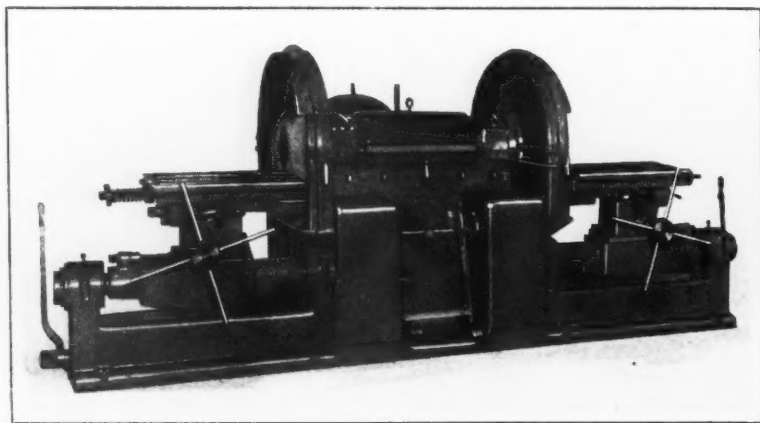


Fig. 1. Gardner "Super" Disk Grinder for Heavy-duty Work

GARDNER DISK GRINDING MACHINES

Booth No. 1-W-20

Two 40-inch steel wheels faced with heavy-type GIA grinding disks comprise the grinding members on the No. 9 40-inch "Super" disk grinder exhibited by the Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. This machine, which is illustrated in Fig. 1, is intended for heavy-duty work and is semi-automatic. The steel wheels are supported by 29-inch diameter flanges mounted on a spindle that measures $5\frac{7}{8}$ inches in diameter at the bearings. The spindle is carried in Timken tapered roller bearings.

The machine may be driven either by belt or by a direct-connected motor of from 25 to 40 horsepower. Mechanical means are provided for rocking the two work-tables automatically. They may be operated independently or together. Their oscillation is regulated through conveniently located hand- and foot-levers, and the work is fed into the cutting members by spring action. On many jobs one operator can attend to both ends of the machine. The machine weighs approximately 16,000 pounds.

Fig. 2 shows a special No. 84 machine arranged for grinding hexagon nuts. It is provided with a revolving steel disk equipped with a series of studs on which the nuts are placed to be carried between the two grinding wheels. Two side guides keep the nuts from turning and present them to the grinding

wheels in the proper position. On the upper side guide there is an indexing device which turns each

nut $\frac{1}{6}$ of a revolution as it passes, thus causing two new surfaces to be ground each time a nut is brought to the wheels. After a nut has been ground on all six surfaces, it is automatically ejected from the studs. This is accomplished by two arms which are so actuated by a timed cam arrangement that each nut passes the grinding wheels three times before it is ejected.

In the operation of this machine the attendant is only required to keep the empty studs reloaded as they come to the loading position. Both hand- and foot-levers are connected to a friction clutch for starting and stopping the feeding mechanism quickly.

The same concern will also exhibit a new double-spindle polishing lathe of the "Speed-U-Need" type.

LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINE

Booth No. 1-W-17

The exhibit of the Lucas Machine Tool Co., Cleveland, Ohio, will include a No. 41 "Precision" horizontal boring, drilling, and milling machine with a 3-inch spindle, which was recently developed to supersede the No. 31 model. The new machine is heavier and more powerful than

the previous design, and has a wider bed with leveling screws that facilitate setting up the machine accurately. The saddle is longer, and has patented automatically equalized clamps which are operated from the front to bind the front and rear caps of the saddle simultaneously under

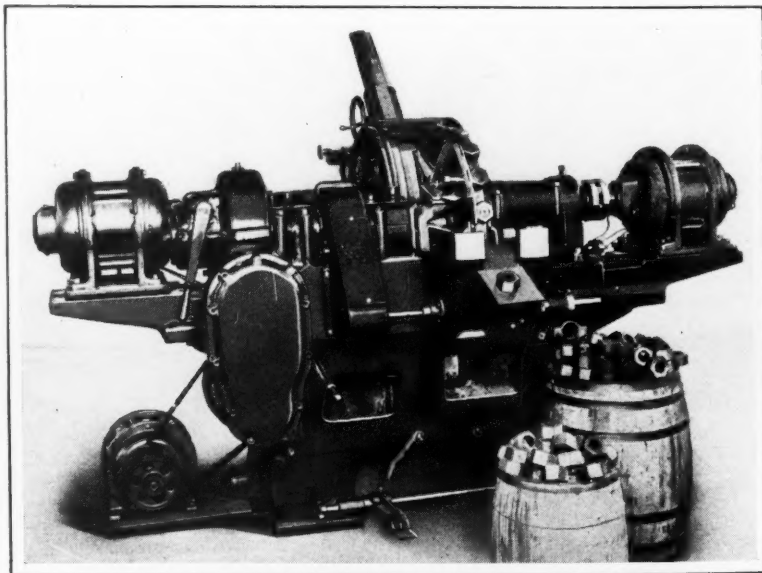
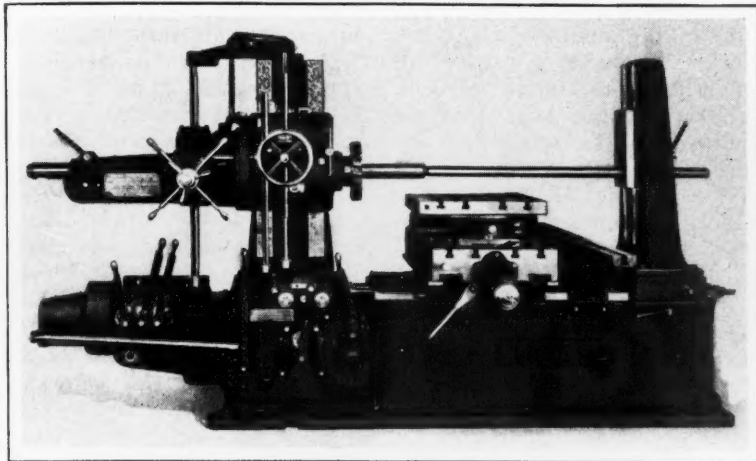


Fig. 2. Special Gardner Grinder for Finishing the Sides of Nuts



Lucas Improved Boring, Drilling and Milling Machine

the ledges of the bed ways. This construction resists any tendency of the saddle to tilt when the table is in the extreme forward or rear position and is heavily loaded. More efficient and convenient means of clamping the table and the spindle head are also furnished.

There is a wider speed range than before, both higher and lower, and the number of speed changes has been increased 50 per cent. Automatic lubrication is furnished by a pump in the driving gear-box and oil-rings on the spindle. More convenient location of the various controls and added safety provisions are other features of the new design.

This machine completes the "40" series that includes the larger size Nos. 42 and 43 machines which have 4- and 5-inch spindles, respectively. A new square swiveling table, which is shown in the illustrations, has been brought out for use on all three machines. This table is mounted on a baseplate, and is interchangeable on different machines. It is graduated in half degrees, and is regularly furnished with a bolt for locking it in four positions 90 degrees apart.

To facilitate swiveling, the square table is furnished with an elevating ball thrust bearing that lifts the table slightly off its baseplate. The lever that operates an elevating screw beneath this ball thrust bearing is interlocked with the indexing lock-bolt and an improved clamp

of the split ring type, so that with one movement of the lever, the table is clamped against rotation and held firmly down on the baseplate. This table is made in two sizes, 26 and 37 inches square, respectively.

The machine may be equipped with a dial-indicator indexing device which, with special length gages, standard end measuring rods, inside micrometers, etc., may be used for accurately adjusting the spindle head vertically on the column and the table crosswise to obtain correct center distances between parallel holes that are to be bored.

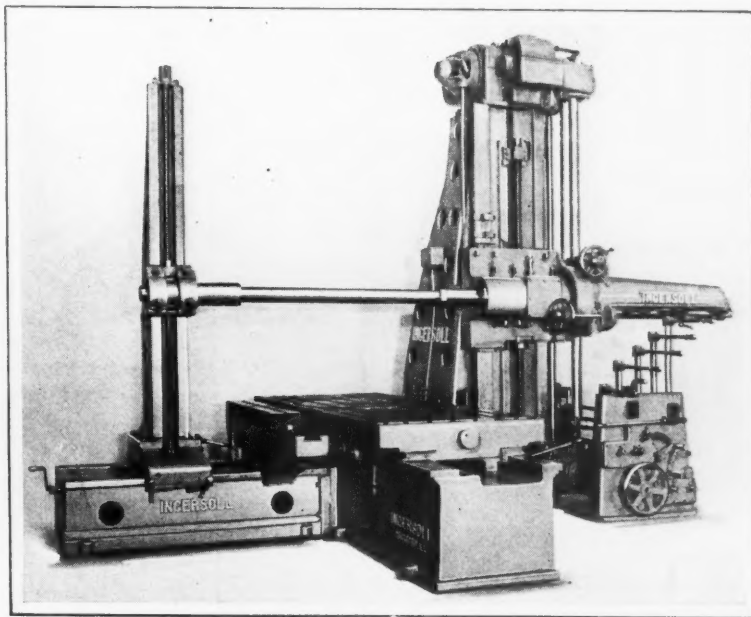
INGERSOLL OPEN-SIDE MILLING AND BORING MACHINE

Booth No. 1-C-1

All movements of the open-side milling and boring machine here illustrated, which will comprise one of the exhibits of the Ingersoll Milling Machine Co., Rockford, Ill., are controlled from a panel which facilitates the operation of the machine when much of the work to be performed is high above the table. With this arrangement the operator can reach all levers while standing in a position sufficiently above the floor to enable him to watch the progress of an

operation on high work. This type of panel control is not only furnished on milling and boring machines, but also on various Ingersoll planer-type milling machines. The machine illustrated is equipped with a 6-inch bar and a table 4 feet wide by 10 feet long. It weighs approximately 25 tons. Larger machines of the same type are built with 8-, 10-, 12-, and 14-inch bars and with tables up to 50 feet long.

The housing is bolted to the bed and is designed to rest solidly



Ingersoll Open-side Milling and Boring Machine in which All Movements are Controlled from a Panel



on the foundation. The outboard support for the boring-bar may be readily removed when the machine is to be employed in milling large work. Such pieces often have a considerable overhang that may be supported by the auxiliary table, the top surface of which is accurately finished to the height of the main table. With work bolted in place on both tables, the auxiliary table slides with the main table. In boring operations, when the bar is supported at the outer end, the outboard bearing moves synchronously with the spindle saddle.

Machines of this type are built with a "bar" head for combina-

tion milling and boring operations. Where a purely open-side milling machine is required, a heavy milling head may be mounted on the same housing. This milling head has a power quill feed which is sufficient for performing many boring operations.

Another interesting point concerning both this machine and the rail-milling machine shown on page 96 is that the bearing ways are finished by milling without any subsequent scraping. Careful tests show that by the use of the milling process a sufficiently good bearing is obtained to meet the most exacting requirements.

RYERSON FLUE-MAKING, SAWING, SHEARING AND PUNCHING EQUIPMENT

Booth No. 2-D-2

Four recent additions to the line of equipment manufactured by Joseph T. Ryerson & Son, Inc., 16th and Rockwell Sts., Chicago, Ill., include a flue-cutting and polishing machine, flue roller, high-speed friction saw and combination shear, punch and coper. The first-mentioned of these machines has been developed for use in locomotive shops where boiler

tubes and flues are butt-welded electrically. This machine combines the two operations of cutting off the fag end of the tubes or flues and of polishing the end that is to be placed in the welding machine.

As may be seen in Fig. 1, the machine has two spiral rollers on which the tube is placed. There is also an overhead drive roller

operated by an air cylinder, which is brought down on top of the tube to rotate it on the spiral rollers. This causes a slight scraping action against the tube which removes all scale and exposes the bare metal.

A separately operated cut-off attachment mounted on the machine is actuated by an air cylinder so arranged as to provide a slow movement of the arm. The cut-off disk on the end of the arm is brought down to sever the fag end while the tube is being polished. The equipment has a capacity for handling tubes up to 6 inches in diameter and is driven by a five-horsepower motor running at 1200 R.P.M.

The flue roller, which is shown in Fig. 3, rolls down the weld of the tube and safe end after they have been welded together, using the same heat. This machine has a large hollow cylinder that is rotated by a silent chain connected to a 5-horsepower motor. The front of the rotating cylinder carries three idler rollers which are adjustable in and out from the center. A stationary mandrel which supports the tube in the center of the rotating cylinder, is provided with a former to suit each size of tube that is handled.

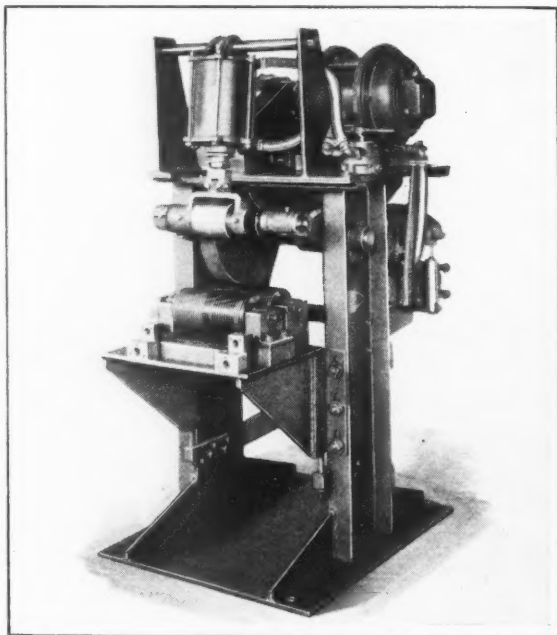


Fig. 1. Ryerson Machine for Cutting off and Polishing Boiler Flues and Tubes

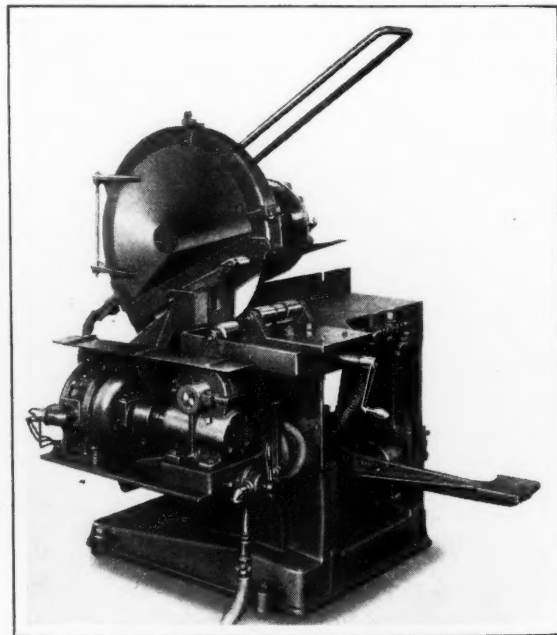


Fig. 2. Ryerson High-speed Friction Saw with Stock-rotating Attachment

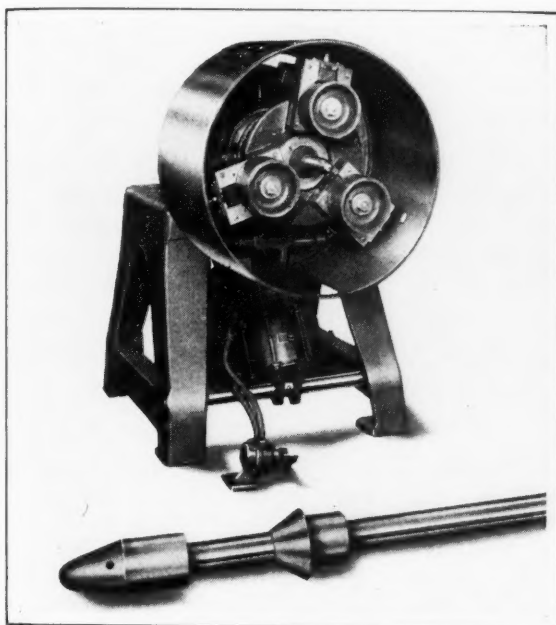


Fig. 3. Machine for Rolling Down the Weld and Safe End of Boiler Flues and Tubes

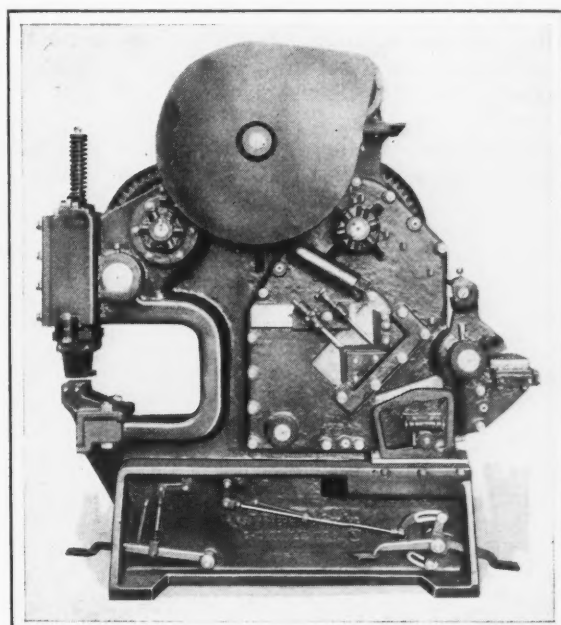


Fig. 4. Shear, Punch and Coper of Larger Capacity than Previous Ryerson Models

In an operation, the safe end of the tube is pushed over the welding former until the weld is directly under the rollers. These are then brought down on the heated weld by moving a foot valve to actuate an air cylinder, after which the head revolves the rollers around the weld, smoothing it down on both the outside and inside of the tube. This machine also handles tubes up to 6 inches in diameter.

The No. 0 high-speed friction saw shown in Fig. 2, is designed for cutting the smaller sizes of round tubing, pipe and bar stock without burrs. This machine is equipped with a stock-rotating attachment which increases the capacity while at the same time reducing the load on the saw motor. The attachment consists of a special work-table on which rollers are mounted for supporting the stock being cut. One set of rollers is driven by a fractional-horsepower motor through a speed-reduction unit and gearing. The second set is mounted on a bracket which may be adjusted in or out to suit various sizes of stock. A third roller is brought down on top of the stock by an air cylinder to hold the stock firmly while it is rotating.

Structural shapes can be handled by dropping the drive rollers

and replacing the adjustable bracket with a work-table plate. The main motor of this machine has a rating of 10 horsepower and runs at 3600 revolutions per minute. The saw is 24 1/2 inches in diameter. Non-ferrous metals, such as aluminum, brass, zinc and babbitt, are cut at high speed by employing a special blade with sharp inserted teeth. For such materials, a positive screw-feed is substituted for the regular hand-lever and foot-treadle feed and a 7 1/2-horsepower motor is employed.

The No. 7 combination shear, punch and coper shown in Fig. 4, is of the same general construc-

tion as smaller machines of this type made by the same concern, but it has a capacity for punching 1 5/16-inch holes through 1-inch plate. The plate shear handles 3/4-inch material of any length or width. Flat bars up to 7- by 1-inch can be sheared, as well as 2 1/4-inch round bars, 2-inch square bars and 6- by 6- by 1/2-inch angle-irons. The shearing end of the machine is so constructed that a single slide handles the shearing of angle-irons, the cutting of bars, the shearing of plates and coping. The angle shear blades are made in sections for economical and quick replacement.

FOOTE-BURT HYDRAULICALLY DRIVEN BROACHING MACHINE

Booth No. 1-A-12

Hydraulic equipment gives a cutting stroke of any desired speed from 10 to 40 feet per minute and a fast return on the No. 1 surface broaching machine to be exhibited by the Foote-Burt Co., Cleveland, Ohio. This machine is intended for roughing and finishing one or more flat or irregular surfaces in one operation. All work within certain sized limitations is handled by a machine of standard dimensions,

but fixtures and broaches are designed special for each job. In most cases four-station automatically indexing work-tables are used and the production rate is set to the speed at which the operator can reload the work. Tiering several pieces of work and the use of simple one-movement clamp levers, enable unusually high rates of production to be obtained.

The broach can readily be re-



moved from its holder on the slide for resharpener by withdrawing a few socket-head cap-screws, and the edges only are "touched up" on a grinding wheel. Then the tool is quickly replaced in a locating groove of the holder. The broach slide is bolted direct to the lower end of the hydraulic plunger or piston-rod and moves up and down on long narrow dovetail ways.

The hydraulic pump is of standard make, runs at a speed of 650 revolutions per minute and develops a pressure of 1000 pounds per square inch. The cylinder is made of double steel tubing and is fitted with a piston head having automobile-type rings that seal it against leakage and insure a constant pressure with full power on both the up and down strokes. The direction of the oil flow in the cylinder is controlled by a three-way valve operated by dogs on the slide. The action of the slide is automatic, but may be stopped or started at any point by operating a hand lever; it may be reversed by turning a handwheel. The pump, cylinder and all piping are

enclosed in the column, but are accessible through a door.

The base of the machine serves as a tank for cutting oil. It is designed with baffle plates that prevent chips from entering the pump compartment at the rear. The chips can be conveniently removed by swinging up the operator's platform at the front. The coolant is supplied to the

work by a centrifugal pump submerged in the oil sump and driven by a 1/4-horsepower motor. A 7 1/2-horsepower constant-speed motor running at 1800 revolutions per minute is usually recommended for driving the machine. It is mounted on the back of the column and transmits power to the hydraulic pump through a silent chain.

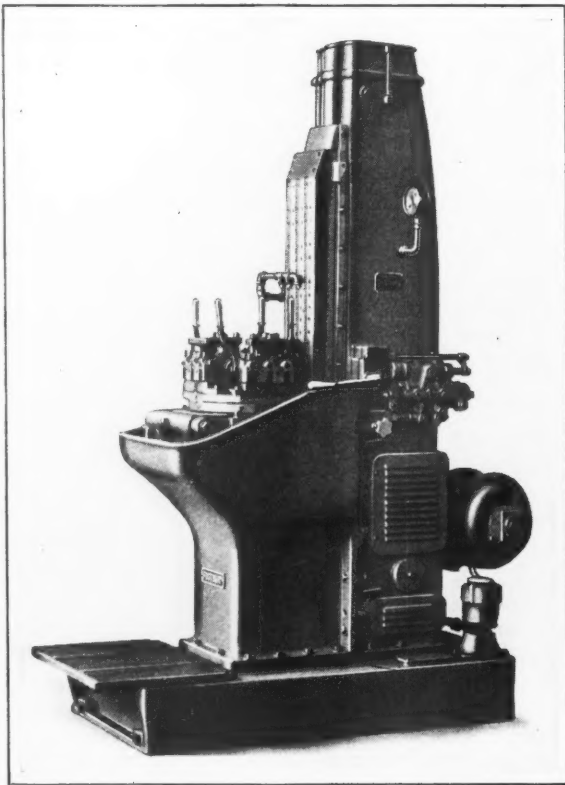
FOOTE-BURT MECHANICALLY AND HYDRAULICALLY FED DRILLING MACHINES

Booth No. 1-A-12

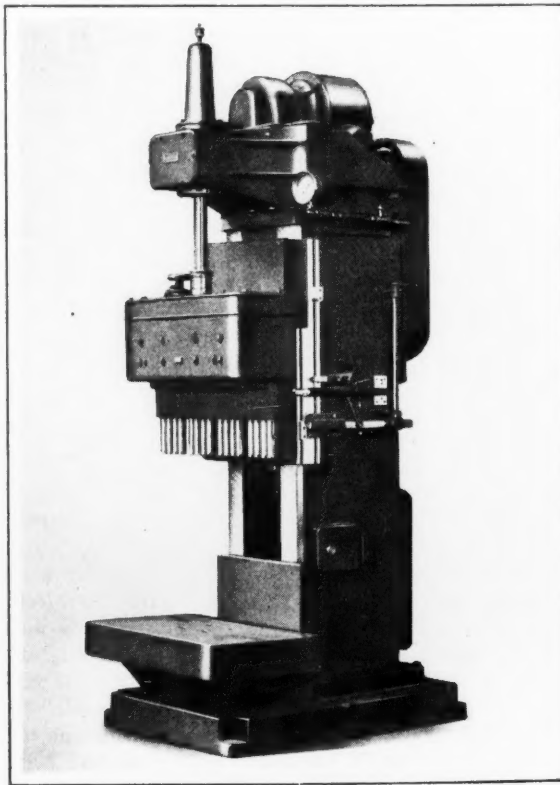
Two No. 16 vertical multiple-spindle drilling machines, one with a mechanical feed and the other with a hydraulic feed, have been added to the machine tools built by the Foote-Burt Co., Cleveland, Ohio. These machines are advantageous in the automotive field on eight-in-line motors and are also intended for jobs in other fields which have been too heavy for the former line of machines. The mechanically fed machine has 16-inch ways, and the hydraulic machine, 20-inch ways and a wider column

to accommodate the cylinder. Both machines have the same drilling capacity. The No. 15 1/2 line of machines built by the company has also recently been increased by the addition of a hydraulic machine with 14-inch ways, the No. 15 1/2-D having 10-inch ways, and the No. 15 1/2-F, 12-inch ways.

While the No. 16 machines are adaptable to many kinds of work, each individual machine is built around the particular job for which it is to be used. All machines have a standard base, up-



"Footburt" Hydraulic Broaching Machine
Equipped for Castellating Nuts



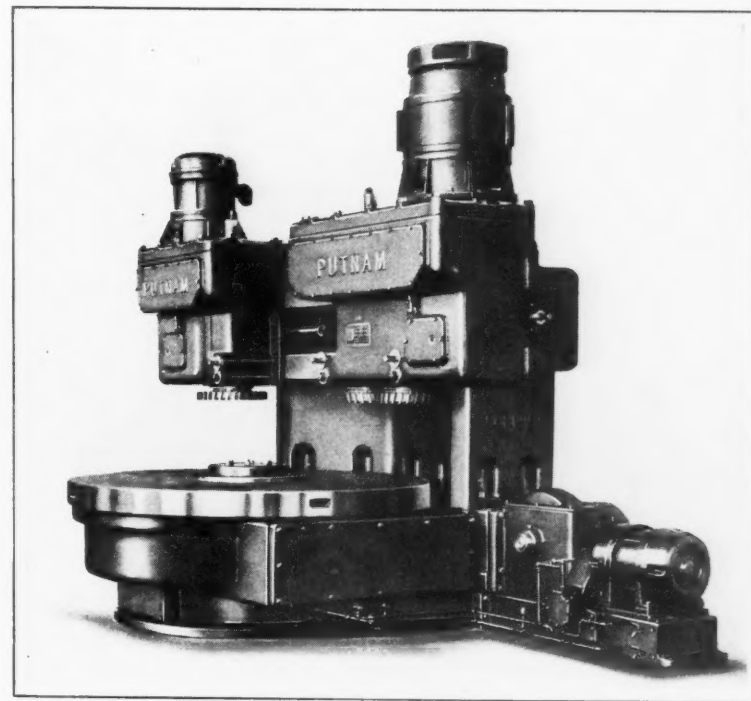
"Footburt" Multiple-spindle Drilling Machine with
Mechanical or Hydraulic Feed



right and drive bracket, but the table, head, drive and feed and speed arrangements are varied to suit the work. A standard table is designed to slide on the ways of the upright, but it is usually held in one position by spacer blocks placed between it and the base.

The heads are individually designed with special gearing so as to obtain the proper speeds and locations of the spindles. All spindles have ball thrust bearings and can be equipped with adjustable collets so as to permit individual vertical adjustments. Lubrication of the head is accomplished by means of a forced feed oiling system. The motor is mounted on the upper drive bracket and there is a safety device to protect the motor and the machine in case the latter should become stalled.

The hydraulic machine is usually equipped with an Oilgear QM pump and a 5 1/8-inch cylinder designed for a stroke of 16 inches. This equipment gives a fast forward traverse of 175 inches per minute, two slow forward feeds of from 1 to 13 inches per minute, two slow return feeds of from 1 to 13 inches per minute, and a fast return traverse of 250 inches per minute. The two forward and reverse



Putnam Rotary Continuous Milling Machine Equipped with Two Unit Heads

feeds make the machine adaptable to almost any condition arising from the use of combination tools or indexing tables. All head movements are automatically controlled throughout the cycle by dogs located on the head slide.

and flat bearing surfaces. While the table is driven by an individual motor, all motor controls are so arranged that the failure of either of the motors driving the unit heads will automatically stop the table. Change gears permit different table feeds to be used to suit conditions. The approximate weight of this machine is 25,000 pounds.

PUTNAM ROTARY CONTINUOUS MILLING MACHINE

Booth No. 2-B-5

Unit milling heads have been applied to a 72-inch rotary continuous milling machine recently developed by the Putnam Machine Works of Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York City. This machine is designed for use in automobile or other industrial plants having large numbers of duplicate parts to be finished. As shown in the illustration, the machine is equipped with a two-spindle head for taking roughing cuts, and a single-spindle head for finishing cuts. Both heads are adjustably mounted on a rail so that the horizontal distance from the spindles to the center of the table may be varied to suit the work.

The simplest form of Putnam unit head known as the "manufacturing head" is used. Means are provided for adjusting the position of the head quills to compensate for cutter wear. Each head is furnished with a constant-speed motor to give a single spindle speed which may be varied by means of change gears to meet production requirements.

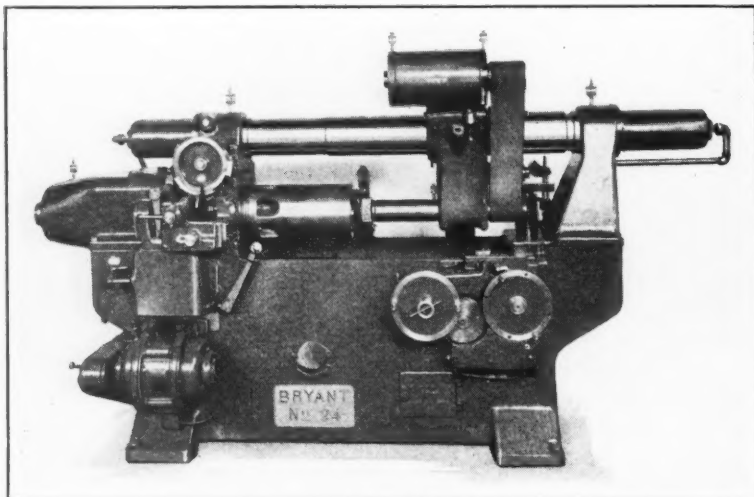
The rail upon which the heads are mounted and the column which supports it constitute an integral casting which is made wide at the base where it is attached to the bed casting. The rotary table is driven by a worm-wheel so cut that the pressure is always downward on angular

BRYANT AUTOMATIC HOLE-GRINDERS

Booth No. 2-B-12

The unusual length and size of the work-spindle is a feature of the No. 24 motor-driven deep-hole grinding machine here illustrated, which was recently built by the Bryant Chucking Grinder Co., 350 Clinton St., Springfield, Vt. It is designed for high-production grinding on large and long bores. Hydraulic control and an automatic sizing arrangement are other features incorporated in the design. The machine is based on the same fundamental single-slide control as previous Bryant machines.

The No. 3 heavy-duty semi-automatic hole-grinder, also built



Bryant Deep-hole Grinder with Hydraulic Control and Automatic Sizer

by the same company, is now equipped with larger driving shafts, wider belts, and a larger motor than previously. A "Tex-rope" drive is also provided. These improvements have increased the grinding range of the machine so that much larger

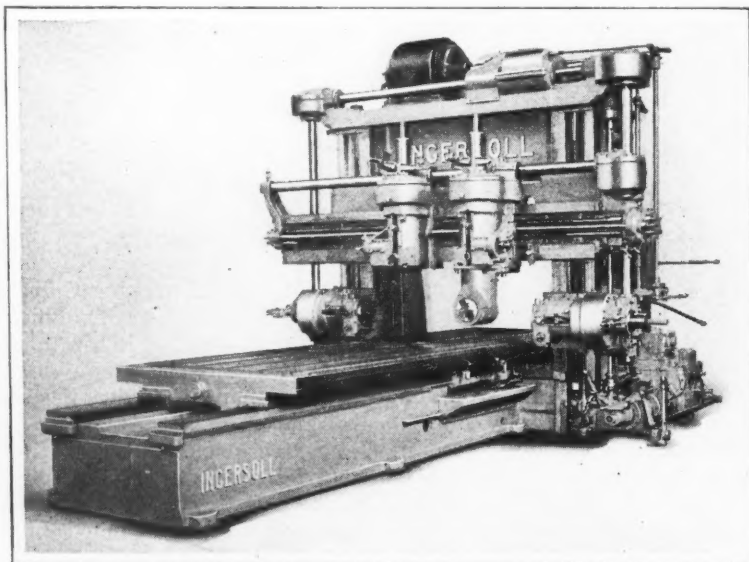
holes can now be ground at production rates comparable with those that were formerly attained on smaller work. A complete description of the previous model of the No. 3 machine was published in the September, 1925, number of MACHINERY, page 68.

INGERSOLL FOUR-HEAD RAIL-MILLING MACHINE

Booth No. 1-C-1

Machines built by the Ingersoll Milling Machine Co., Rockford, Ill., are usually designed to meet the particular requirements of the user by combining standard construction units with spe-

cial features. The four-head adjustable rail-milling machine here illustrated is adapted for use in building such equipment as oil, gas, or steam engines; presses; caterpillar cranes; machine tools;



Ingersoll Rail-Milling Machine with Removable Right-angle Head that Facilitates Cross-milling Operations and Boring of Half-bearings

and heavy machine parts of all kinds. It has a capacity of 66 inches between the housings, and 48 inches under the rail and is equipped with a 16-foot table. This machine weighs approximately 45 tons.

One of the special features of this machine is a removable right-angle head which may be mounted on either of the vertical heads to adapt the machine to the use of face-milling cutters for cross-milling. This provision also facilitates the boring of large half bearings. In cross-milling operations, the head may be simply fed along the rail, or the head and rail may be fed simultaneously.

In boring operations, on such jobs as an engine bed casting having several half bearings, the operation is considerably facilitated by means of a hardened shoulder on the right-angle attachment which marks the spindle center. Before starting the boring operation, the cap seats of the various bearings on the engine bed are face-milled and these finished surfaces serve as reference points. By gaging from these milled surfaces to the hardened shoulder on the right-angle attachment, the operator conveniently determines how far a cutter of the correct diameter must be fed downward in order to machine the corresponding half bearing to the required depth.

Vertical boring operations are obviously performed by using the regular vertical spindle of either vertical head and employing the power quill feed. While this feed is primarily furnished for rapidly setting milling cutters to the correct height, it also affords a ready means of boring as described. Scales and pointers are furnished on all moving members such as the table, rail and saddles, and, in addition, provision is made for the use of dial indicators or verniers.

"AUTO-OILED" SHAPER WITH POWER TRAVERSE

Booth No. 2-D-3

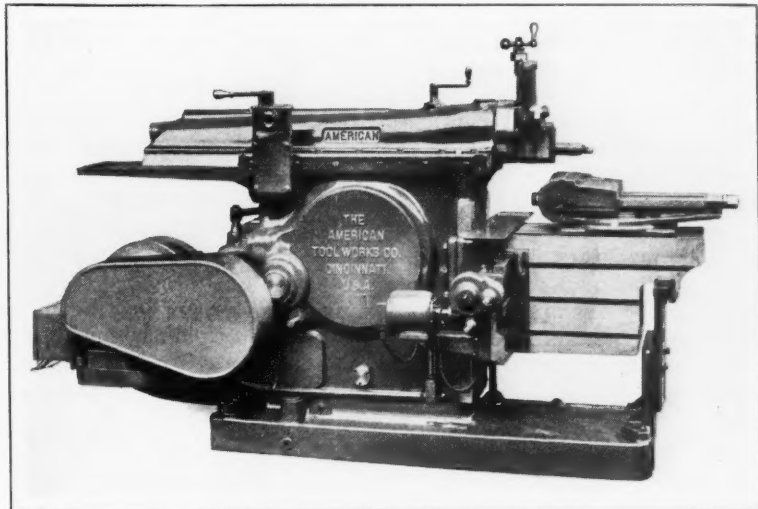
"Auto-Oiled" shapers built by the American Tool Works Co., Cincinnati, Ohio, can now be



equipped as illustrated with a power traverse mechanism for the table. This mechanism is a self-contained motor-driven unit that is entirely independent of the operating mechanism of the shaper itself. Consequently, it never idles and is in action only when the table is traversed along the rail by power.

The motor of the power traverse unit is mounted on the left-hand side of the column as shown in the illustration, and is connected to the cross-feed screw through worm gearing. The unit is controlled by means of forward and reverse push-buttons conveniently located at the operating end of the rail. The power traverse may be used while the machine proper is at rest.

The lever on the machine which is moved to engage the power feed controls an automatic lock-out for the power traverse. This prevents engagement of the power traverse while the power feed is functioning. The lever must be set central to disengage



American "Auto-Oiled" Shaper with Power Table Traverse Driven by Individual Motor

the power feed before the power traverse will function.

"Auto-Oiled" shapers are built in sizes from 16 to 36 inches inclusive. An article describing their construction appeared in September, 1926, *MACHINERY*.

moved and rough pieces substituted. The work-head may revolve constantly or intermittently, depending upon the particular work for which the machine is designed. In any case, the motors that drive the individual chucks are started and stopped automatically with the rotation of the work-head.

On the machine illustrated there are only two chucks on the work-head because, in the operation for which this particular machine was built, there is ample time for unloading and reloading. Standard four-jaw hand-

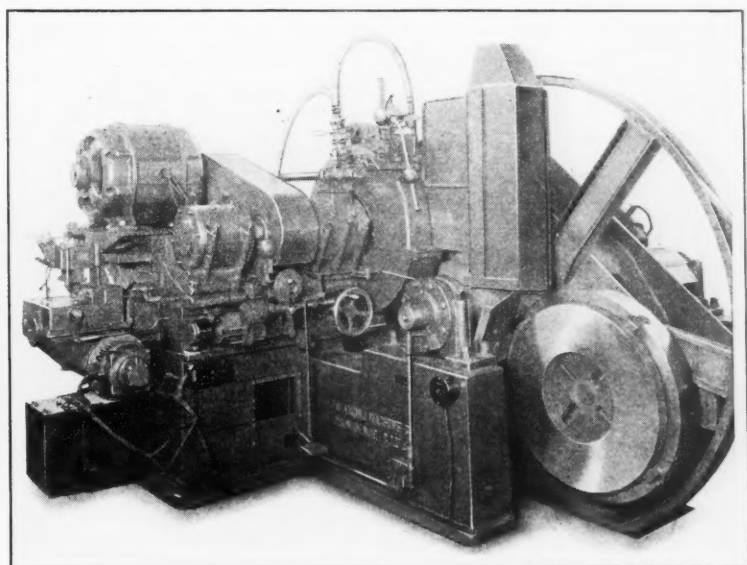
DIAMOND CONTINUOUS GRINDING MACHINES

Booth No. 2-A-8

Continuous-type machines designed for grinding flat surfaces on large quantities of rough castings or forgings of one kind, have recently been developed by the Diamond Machine Co., 9 Codding St., Providence, R. I. The illustration shows a large machine built for use in a plant manufacturing ball bearings, it being employed for finishing ball lapping disks which must be re-ground after relatively short periods of service. A smaller machine of the continuous type was described in December, 1928, *MACHINERY*, page 306.

Instead of the reciprocating table provided on standard machines built by the company, these continuous grinding machines are equipped with a large circular work-holding fixture or work-head, which revolves across the abrasive wheel. Work chucks mounted on this revolving fixture are rotated in turn on their own axes by individual motors mounted on the rear of the work-head and revolving with it. While the

work-head is revolving, some of the chucks are carrying work pieces across the abrasive wheel, and other chucks are exposed so that finished work can be re-



Diamond Grinding Machine with Continuously Revolving Work-Head on which Several Chucks may be Mounted



operated chucks are here used. The type, size, style and number of chucks, and even the design of the work-head may vary. The work need not be of any particular shape or thickness as it is possible to design chucks for handling almost any shape.

Operation of these continuous grinding machines does not require a skilled man, as it is largely a matter of reloading the work. The abrasive wheel is fed slightly forward from time to time to compensate for wear. An indicator arm is usually attached to the machine so that the operator can gage the thickness of fin-

ished pieces and be guided in the amount that the wheel is to be fed forward.

The abrasive wheel is of the segmental block type and is held in a Diamond patented chuck. The segments may be advanced as they are worn away until all but about one inch of their depth is left. Timken tapered roller bearings are provided for the spindle. Coolant is pumped to the grinding point from a tank that is usually an integral part of the machine. These machines can be built with abrasive wheels 18, 30, 36, 54 and 66 inches in diameter.

GOULD & EBERHARDT MANUFACTURING TYPE GEAR-HOBGING MACHINES

Booth No. 1-B-6

Fine-pitch gears of small diameter, such as are used in photo-phone apparatus, navigation instruments and automotive engines, can be produced in the 9-H universal manufacturing-type gear-hobbing machine illustrated in Fig. 2, which is a recent development of Gould & Eberhardt, Newark, N. J. This machine is adapted for accurately generating spur, helical, herringbone and worm gears up to 9 inches in diameter when using the arbor support, and up to 12 inches in diameter with the sup-

port removed. Teeth up to 10 diametral pitch can be cut in steel.

The cutter-slide can be swiveled through an angle of 180 degrees for cutting either right- or left-hand helical gears of any angle. The work-table is mounted on anti-friction bearings, and is located in a fixed position. An adjustable arm that can be locked in any required position is provided for the work arbor support.

Pressure lubrication automatically supplies oil to the main mechanism in the gear-case and

includes cascade oiling to the change-gears which are enclosed in oil-tight compartments. The indexing worm and worm-wheel are immersed in oil, while the cutter-slide guide ways, stanchion and other parts are lubricated by a gravity system. A separate pump and reservoir supplies coolant to the hob. A motor of three-horsepower capacity, running at 1200 revolutions per minute, drives the machine either through a belt or a silent chain.

Nos. 48-HS and 48-HL manufacturing-type hobbing machines have also been recently brought out by the same concern. These machines, one of which is shown in Fig. 1, are designed for roughing and finishing spur and limited-angle helical gears of large diameter and medium pitch, as well as sprockets and worm-wheels such as used in tractors, railway cars, and mining and hoisting equipment. In general construction they follow the smaller-sized Nos. 12-HS, 24-HS, 36-HS and 36-HL machines.

The new machines are rated for cutting teeth in steel up to 2 diametral pitch. Gears up to 32 inches in diameter can be produced when using the arbor support, and up to 57 inches in diameter with the support removed. The weight of the machines is approximately 14,000 pounds.

The cutter- and work-drives are balanced with eight gears in each train, which insures uniform rotation between the cutter- and work-spindle. There is a power rapid traverse for moving the cutter at the rate of 50 inches per minute in either direction. The traverse can be operated with the work-cutter spindle idle or rotating. The traverse- and feed-controls are interlocked so that one cannot be set in motion before the other is disconnected.

The cycle of cutter movements consists of a rapid approach, feed and rapid reverse, with each movement automatically arrested at a predetermined point. The feeding motion automatically disengages the main clutch

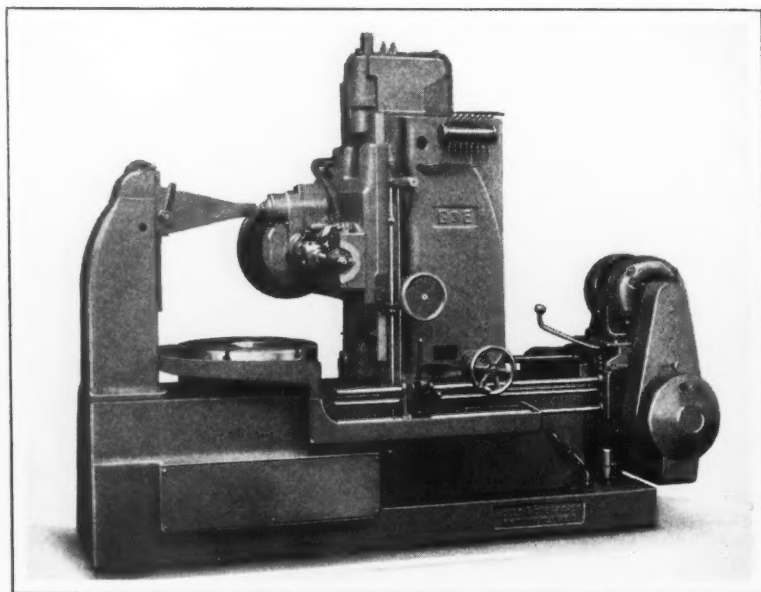


Fig. 1. Gould & Eberhardt Manufacturing-type Gear-hobbing Machine for Cutting Gears up to 57 Inches in Diameter

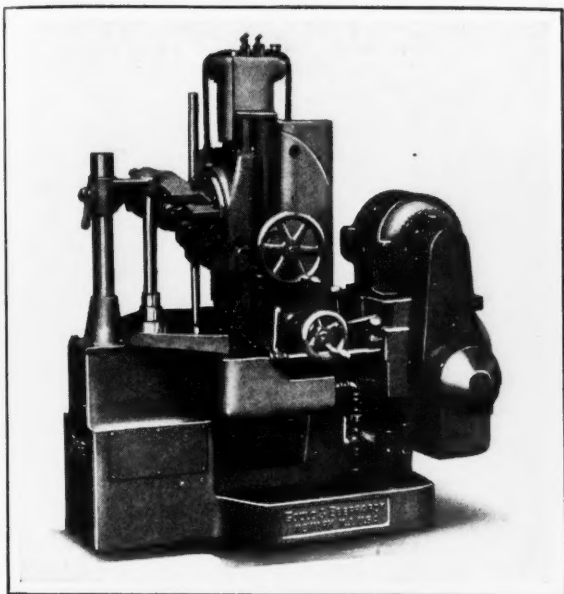


Fig. 2. Gould & Eberhardt Manufacturing-type Gear-hobbing Machine for Small Fine-pitch Gears

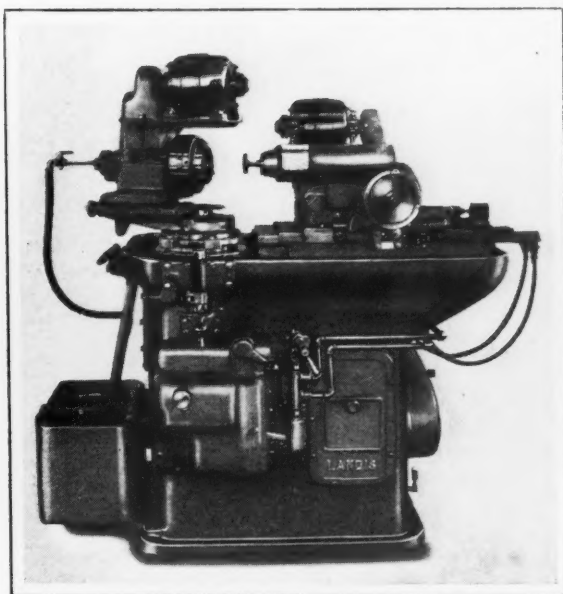


Fig. 1. Landis Ball-race Grinder in which Three Machine Movements are Obtained Hydraulically

and stops the machine, but leaves the power traverse available. Adjustable stops govern the movement of the feed and traverse, and fixed safety stops control the extreme limits of motion. A 10-degree angular adjustment of the cutter-slide is provided for single, double or triple thread hobs. The hobs can be shifted axially to permit using their full length.

On these machines also, pres-

sure lubrication automatically supplies oil to the gear case and the work-spindle, and there is cascade oiling of the change-gears. The machines may be supplied with full equipment for cutting a diversified range of gears, or with limited equipment for cutting one kind only. A constant-speed motor of from 10- to 15-horsepower, operating at 1200 revolutions per minute, is recommended.

belt. The wheel-truing fixture is attached to the front of the wheel-head only when in use; it is adjustable for different radii.

The vertical spindle is oscillated by means of a double-blade oil motor. A balanced piston-type reversing valve controls this motor and adjustable reversing dogs mounted on a ring at the top of the spindle, regulate the length of the arc of oscillation. The work-head spindle is driven by belt from a motor mounted over the oscillating center. The work-head may be adjusted toward the center of oscillation or at right angles to the oscillating movement.

Fig. 2 shows a 6-inch type-C plain hydraulic grinder shown in Fig. 1 for oscillating the work-head, feeding the wheel-head and traversing the wheel-head slide. This machine is a recent development of the Landis Tool Co., Waynesboro, Pa. Either internal or external raceways or face raceways for end thrust bearings, as well as other forms of radial work, may be ground.

Moving the main control lever causes the work to rotate, the work-head to oscillate and the wheel carriage to traverse, simultaneously. Near the end of the wheel carriage movement, the wheel-head starts to feed in rapidly, slowing down as the wheel nears the work. As the wheel

comes in contact with the work, the grinding feed is engaged. The grinding feed then controls the speed of the in-feeding movement, which ceases automatically when a positive stop is reached as the work is ground to size. By throwing the control lever in the opposite direction, the movements are reversed, the machine members being returned to their original positions and stopped to permit changing the work. One operator can run two machines.

Three motors drive the machine. The grinding-wheel spindle runs in steel-back babbitt bearings which are adjustable for wear, and has a speed of 7760 revolutions per minute. A motor on the wheel-head drives the spindle through a woven endless

Hydraulic straight in-feed to the grinding wheel-head and a reciprocating wheel-spindle mechanism, may be supplied for plunge-cut grinding. The base of the machine bed forms a reservoir for the oil used by the hydraulic system. The work car-

LANDIS HYDRAULIC GRINDING MACHINES

Booth No. 1-W-18

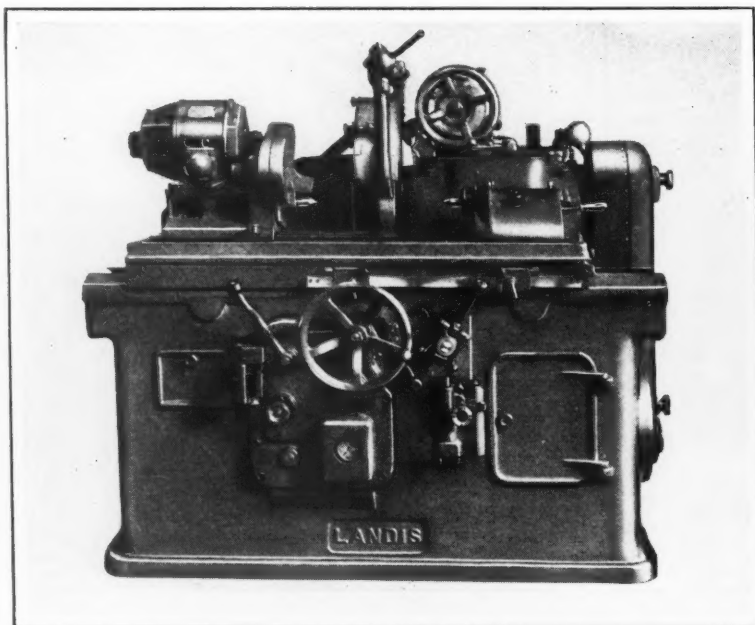


Fig. 2. Landis Plain Hydraulic Grinder Designed for Such Parts as Axle-shafts, Pistons and Small Armatures

riage travels on a vee and a flat guide having chilled surfaces which are thoroughly protected. The grinding wheel-head is also supported by a vee and a flat guide having chilled surfaces. The grinding-wheel spindle is driven by multiple V-belts. A 24-inch diameter wheel is used. The grinding-wheel cross-feed may be accomplished automatically or by hand. Steel-back babbitt bearings which are adjustable for wear are provided for the wheel-spindle. They are lubricated by a pump driven from the spindle itself.

The traversing oil-pump is of the low-pressure gear type and is driven from the water-pump shaft by a silent chain. The traversing oil motor is of the four-impulse, two-chamber continuous type and, like the pump, has all parts running in oil and is equipped with anti-friction bearings. Very slow traverse speeds are secured by engaging a back gear, while the drive for fast speeds is direct through spur gears. A throttle valve controls the speed of the motor.

The headstock faceplate is driven by an individual motor of the variable-speed type equipped with a field rheostat control. Speed reduction is secured through a double chain arrange-

ment having an automatic adjustment. Provision is made at the rear of the machine for mounting and driving a direct-current generator when direct current is not available for the faceplate motor. The main drive motor is mounted on the rear of the bed with the multiple V-belt pulley in line with the wheel-spindle pulley.

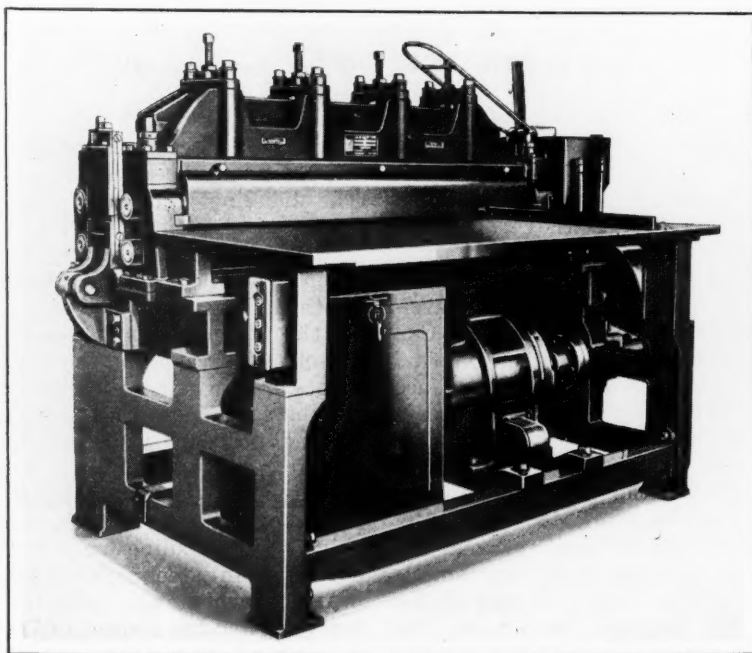
PUTNAM ROTARY GANG SLITTING MACHINES

Booth No. 2-B-5

Improved models of the Lamb & Nash line of slitting machines recently purchased by Manning, Maxwell & Moore, Inc., 100 E. 42nd St., New York City, have recently been brought out by the Putnam Machine Works, a subsidiary of the latter concern. These slitting machines are built in three sizes: the light B-type machine, the medium F-type machine, and the heavy K-type machine. The latter will be exhibited at the Show.

These machines are arranged with the cutter-frame interposed between two sets of feed-rolls. The cutter-frame carries two cutter-shafts and is arranged to swing out from between the rolls to give accessibility in setting up and adjusting the cutters. A solid cutter-frame is standard equipment, but an adjustable cutter-frame can be furnished.

The solid cutter-frame is designed for chair-type cutters only, which are fitted to, and supported in, chair shaped bearings. This type of cutter is not supported by the cutter-shafts which function only as drivers. Cutting strains are backed up



Putnam Rotary Gang Slitting Machine Embodying Improved Features



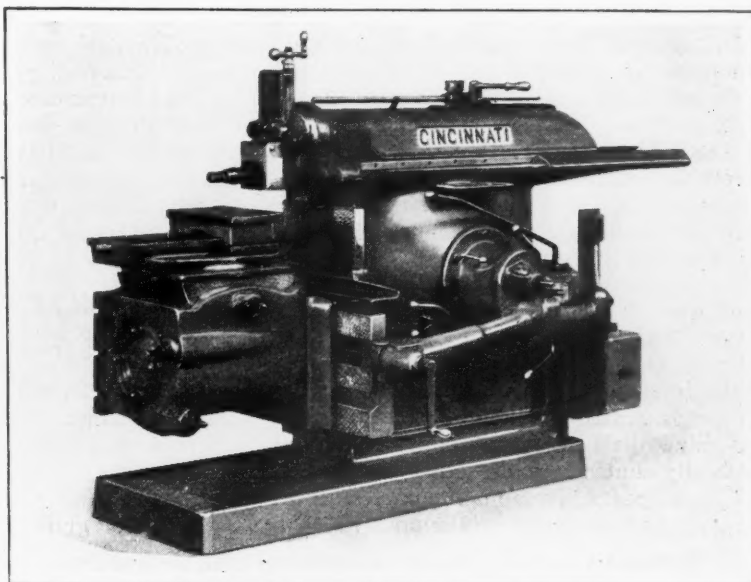
solid through the chair- and cutter-frame and the main frame of the machine, which eliminates bending strains on the cutter-shafts. When cuts must be taken that are narrower than minimum-width chair-type cutters, the adjustable frame is used with block type cutters.

CINCINNATI SHAPERS

Booth No. 2-W-17

Two heavy-duty shapers, a 16-inch and a 24-inch, will be exhibited by the Cincinnati Shaper Co., Cincinnati, Ohio. Both machines have a built-in power traverse to the table.

The 16-inch shaper will be shown equipped, as the machine here illustrated, with the Cincinnati universal table, which consists of a revolving table having a tilting top. There are no hinges, jacks or table supports. The 16-inch shaper can be operated at the highest number of strokes per minute of any shaper ever built by the company. It is provided with a new combination tool tray and cross-rail guard. Timken thrust bearings are furnished on each end of the cross-feed screw to facilitate hand feeding the table. Another feature is the construction of the



Cincinnati Heavy-duty Shaper with Built-in Power Traverse to Table

ram bearings which now extend to the end of the ram and reduce the overhang from the tool to the ram bearing by 2 5/8 inches.

These new features are also built into the 24-inch shaper. This machine will be shown equipped with a full box table.

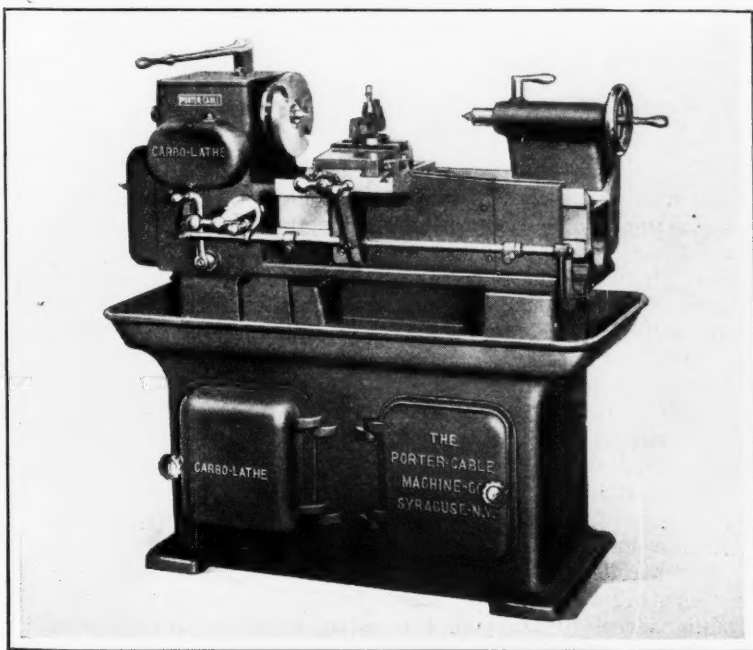
PORTER-CABLE "CARBO-LATHE"

Booth No. 1-W-19

The worm-gear drive of former lathes built by the Porter-Cable Machine Co., Syracuse, N. Y., is incorporated in the

"Carbo-Lathe", here illustrated, which has been designed to meet the recent developments in tungsten-carbide cutting tools. The machine is designed primarily for handling short pieces of work not over 18 inches in length and 7 inches in diameter, and is adapted to performing operations on screw-machine products, pistons, forgings, gear blanks, bushings, piston-rings, and similar work.

Simplified design is an important feature of this 12- by 18-inch production lathe, there being only four major parts in its construction. The headstock and bed are one casting of chrome-nickel iron, and the tailstock is another one-piece casting, weighing approximately 100 pounds. It is clamped to the bed by draw-bolts on a heavy gib. The base is a single casting of a cabinet design containing a chip pan, oil reservoir, and short legs upon which the bed is mounted. The machine occupies a floor space of only 34 by 48 inches and the highest part is 48 inches above



"Carbo-Lathe" Designed to Meet the Recent Developments in Cutting Alloys



the floor, which gives a low center of gravity that is claimed to eliminate all vibration.

Power is furnished by a motor of 3 to 5 horsepower concealed in the cabinet base, although a direct line-drive can be supplied. Power is delivered to the machine through a disk clutch so constructed that immediate release is obtainable at high speed even when heavy cuts are being taken. The control lever that operates the clutch also applies a brake to stop the spindle. Simultaneously with the stopping of the spindle, the coolant is automatically shut off.

Change gears give a maximum ratio of 9.1 to 1 and a minimum

a maximum swing of 14 inches over the ways. The Zerk system of lubrication is furnished.

The facing attachment can be clamped to the tailstock shears in any position and is driven from a rack on the bed. The cross-slide is operated by a cam which gives fast and slow feeds

and a quick return. Timing in relation to the carriage can be obtained by pick-off gears. An air cylinder can be employed for operating chucks, collets, and expansion arbors. A lever chuck closer, taper attachment carriage, and turret are also available.

OLIVER FACE-MILL, DRILL AND TAP GRINDERS

Booth No. 1-W-6

One of the latest developments of the Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich., is the No. 2 "Arc" face-mill grinder shown in Fig. 1, which has capacity for grinding

The corner is always a true arc of a circle tangent to the face and periphery.

The grinding wheel is direct-connected to a motor that is adjustably mounted on a carriage.

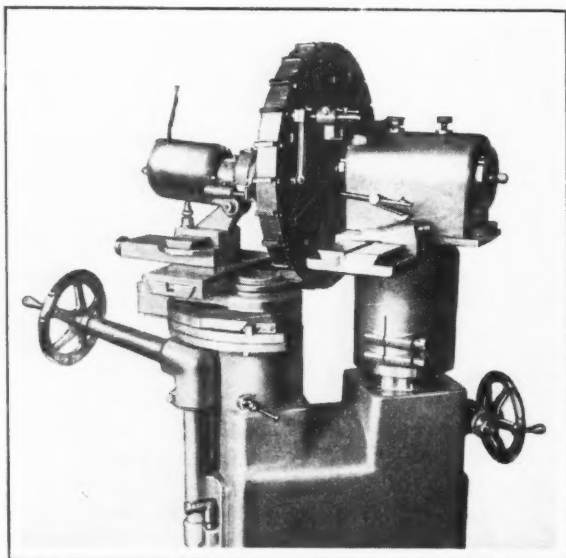


Fig. 1. Oliver Grinder which Sharpens Face Mills up to 26 Inches in Diameter



Fig. 2. Grinder which Produces Various Types of Points on Drills from 3/32- to 1/2-Inch

ratio of 1.75 to 1 between the clutch shaft and the spindle. Other ratios can be obtained by using different-sized motor pulleys, and motors of different speeds can be employed. Two-speed motors are especially suitable. Feeds ranging from 0.005 to 0.030 inch per spindle revolution are obtainable through standard pick-off gears. The spindle revolves in Timken tapered roller bearings, while other revolving shafts are equipped with ball bearings.

Lubricant and chips fall directly through the hollow center of the bed and there are no flat way surfaces, which obviates chips piling up and also allows

cutters up to 26 inches in diameter having blades set either straight or helical, at fine or coarse pitches. They can be ground with any desired angle between the face and the periphery, with any desired face or peripheral clearance, and with any radius at the corner from zero (a sharp corner) up to 2 inches. Grinding is accomplished with one setting of the cutter and one pass of the wheel.

The movements of the machine are so controlled that a turn of the operating wheel causes the grinding wheel to traverse the face of the cutter, turn the corner, and traverse the periphery, with one continuous movement.

The latter moves on a slide rigidly attached to a vertical shaft that is mounted in Timken bearings in the pedestal casting. Adjustments for various cutters are quickly made by means of large protractors.

Fig. 2 shows a bench model of a special No. 21 drill grinder designed for drills from 3/32 to 1/2 inch. The Oliver-type point is produced when desired, but other kinds of points can be produced for countersinking, counterboring, chamfering, etc. Thick-web oil-hole drills and chamfering or nut drills can also be ground. In addition to grinding the cutting edge of drills, the heel is backed off to give



more clearance for chips, which results in cleaner and smoother holes. The point angle may be varied from 60 to 180 degrees, the smaller angles being adapted to drilling wood, slate, fiber and similar materials, and the blunter angles for counterboring and deep-hole drilling.

For the operation, the drill is located in a fixture which is positioned in a holding mechanism. The motor is enclosed in the base and drives the wheel-spindle through a flat canvass belt on which tension is placed by an idler. The spindle is mounted in ball bearings and is adjustable horizontally for obtaining the center clearance or under-cut necessary with various types of points. The construction also provides for grinding shoulder drills.

All taps having a shank less than 1 inch in diameter can be ground on the machine illustrated in Fig. 3, whether they are of the right- or left-hand type and have 2, 3, or 4 cutting edges. An eccentric relief is given the taps, the exact shape of which is determined by a cam that may be altered to give any type of relief. The face or flute of taps may be ground, as well as the cutting face of gun taps.

The machine consists of a hollow spindle mounted in ball bearings in an oscillating frame. Its operation is controlled by cams contacting with a fixed roller. The tap to be sharpened is held in a chuck mounted in the spindle. A lip rest locates the cut-

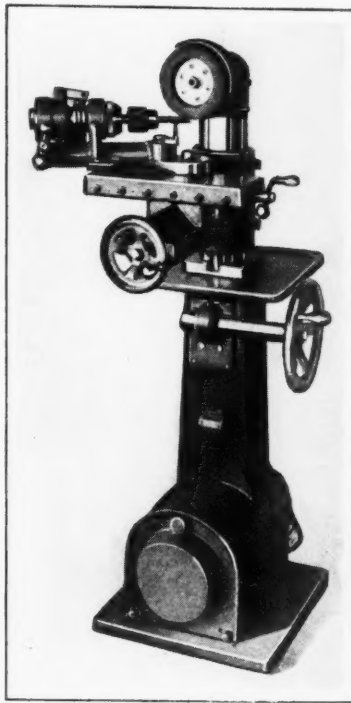


Fig. 3. Oliver Tap Grinder

ting edge of the tap on the center line. There is an index-plate having 12 notches which provides a means of accurately indexing 2-, 3-, or 4-flute taps, and also furnishes a means of locking the spindle while mounting the tap. The spindle is revolved by turning a crank and the entire spindle mechanism may be swiveled about a graduated base to obtain accurate angles for taper, plug or bottoming taps. Right- and left-hand taps are ground in the same way with the same setting of the head.

REED-PRENTICE JIG BORER AND VERTICAL MILLER

Booth No. 2-W-2 and 3

Two purposes are served by the model 5 jig borer and ver-

tical miller being introduced to the trade by the Reed-Prentice

Corporation, Worcester, Mass. When used as a jig borer, the machine is adapted to milling, boring, drilling and reaming operations. It is particularly suited for such work as milling the bases of die-shoes and recesses for the die-blocks. Fig. 3 shows the machine arranged with a hand feed to the spindle, but a head having a power down-feed can be supplied. On the latter head feeds of 0.0025, 0.005 and 0.010 inch are available.

Such features as rapid power traverse of the table in either direction and Timken bearings for all main shafts, including precision Timken bearings for the spindle, are incorporated in the machine. Accurate work on jigs and fixtures is facilitated by brackets with V-blocks which are provided for holding measuring bars and micrometer heads such as shown in Fig. 1. These measuring bars and micrometer heads are placed between the adjustable stops and dial gages attached to the saddle and table. Two micrometer heads with twelve measuring bars provide for adjustments ranging from 1 to 12 inches varying in increments of 0.0001 inch. With this equipment, holes may be accurately located by direct readings. Positioning of the table and the work is accurately controlled by end measures, micrometers and dial indicators. Vernier scales are available.

To facilitate the accurate and quick alignment of the work with the spindle, the electrically-operated indicator illustrated in Fig. 2 is furnished. This indicating equipment has an electric bulb operated from the lighting circuit through a transformer.

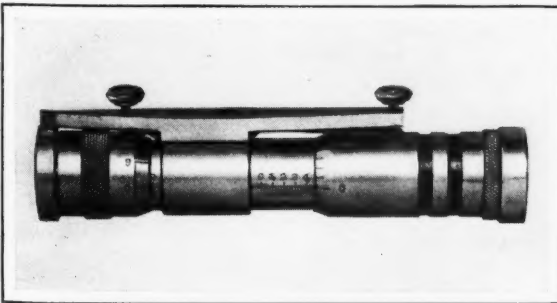


Fig. 1. Micrometer Head Used for Locating on Reed-Prentice Jig Borer



Fig. 2. Electric Indicator Used in Aligning Work With Machine Spindle

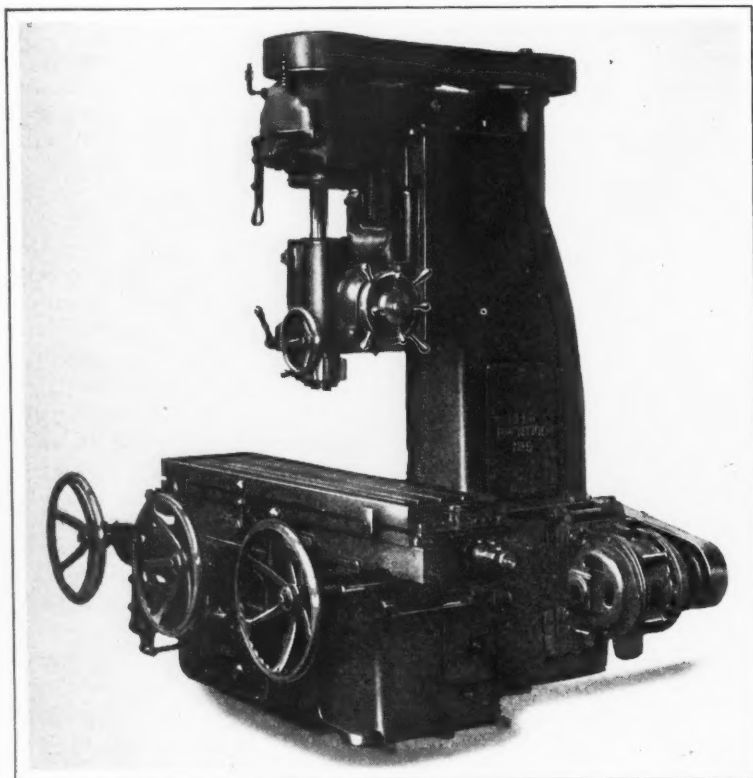


Fig. 3. Reed-Prentice Jig Boring and Vertical Milling Machine

Some of the principal dimensions of the machine are: Working surface of the table, 60 by 16 inches; longitudinal power feed, 48 inches; cross power feed, 16 inches; vertical adjustment of head on column, 15 inches; and vertical feed of spindle, 9 inches. The range of spindle speeds is from 17 to 600 revolutions per minute.

Another exhibit of the Reed-Prentice Corporation will be a 16-inch sliding-gear-head lathe equipped for running at a spindle speed of 1250 revolutions per minute, and cutting cast iron at the rate of 750 feet per minute by employing tungsten-carbide tools. The spindle of this machine is mounted in four Timken bearings. The lathe is of the construction illustrated in June, 1928, *MACHINERY*, page 798.

"TRITROL" ENGINE LATHES

Booth No. 2-W-6

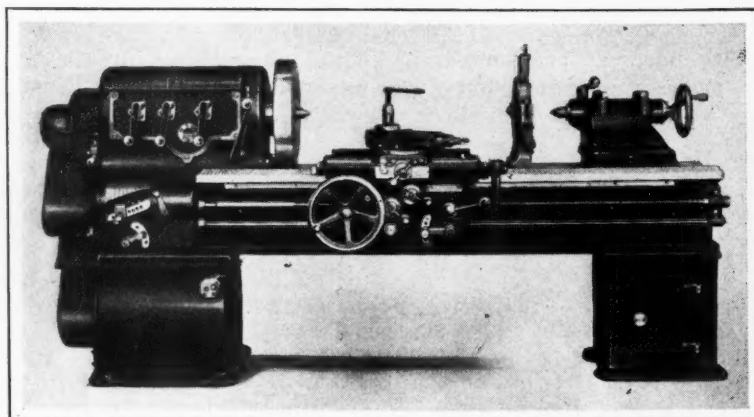
Three levers control the eight spindle speeds obtainable on "Tritrol" engine lathes now be-

feed changes are available on the smaller lathes and thirty-two on the larger.

Two types of headstock are available, their differences lying in the kinds of gears and spindle bearings used. The gears may be either of the spur or herring-bone continuous-tooth type, and mesh constantly. Positive-jaw clutches permit of changing spindle speeds while the spindle is in motion. Timken tapered roller bearings can be provided for all shafts, or tapered bronze bearings for the spindle and Timken bearings for the intermediate drive shafts. Force feed lubrication is supplied by a pump on the drive shaft, oil being sprayed to all moving parts in the headstock.

Instantaneous stopping and starting of the longitudinal and cross feeds is made possible by the provision of a positive snap-lever control on the apron. Six ball thrust bearings take the end thrust of the positive-clutch action and thus insure ease of operation.

One of the principal carriage features is the three-point support provided, there being a flat supporting bearing surface inside of the large front vee, in addition to the support offered by the front and back ways. The machine may be driven either by belt, chain, or "Texropes" from a motor mounted on a base in the cabinet leg. The motor recommended for the various sizes ranges from 3 to 10 horsepower, and the motor speed, from 1200 to 1800 revolutions per minute.



"Tritrol" Engine Lathe in which Three Levers Control Eight Spindle Speeds



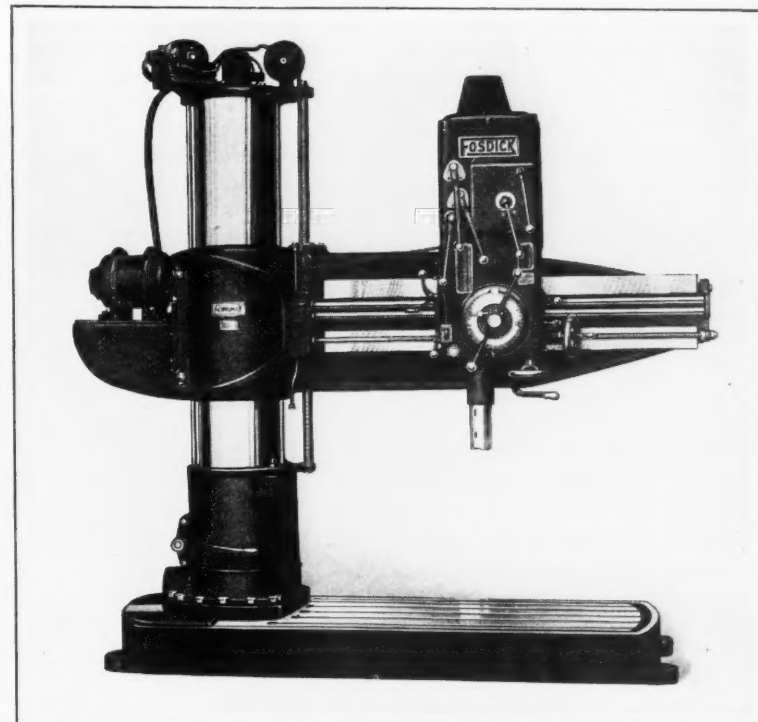
FOSDICK RADIAL DRILLING MACHINE

Booth No. 1-A-3

An electric power clamp which binds the inner and outer columns together to prevent the arm from swinging when drilling, is one of the features of the "Economax" 6-foot radial drilling machine built by the Fosdick Machine Tool Co., Cincinnati, Ohio. This clamp is operated by a switch-controlled motor which imparts the clamping action through a cam and pitman rod mechanism. The column is 19 inches in diameter.

In general construction the machine is similar to the one described in October, 1927, *MACHINERY*, page 167. Safety devices are incorporated in the machine which automatically stop all power-actuated parts when they reach the end of their working range. All operating controls are conveniently positioned within a small radius on the head. The one-speed motor, in addition to furnishing power for 36 spindle speeds and 18 feeds, also operates the rapid power traverse of the head on the arm, and elevates the arm on the column at a rapid constant speed.

It is claimed that instant reversal of the spindle at the highest speeds can be accomplished without shock or injury to the machine. The shaft and spindle bearings are of the roller type and are lubricated automatically with filtered oil supplied



Fosdick Radial Drilling Machine with Power Clamp

by a geared pump in one of the oil reservoirs on the head. A tilting table is furnished, which is constructed of only three major parts that function as a

solid block no matter at what angle the table is tilted. This machine is made in sizes ranging from 3 to 8 feet, inclusive, with either a belt or motor drive

LODGE & SHIPLEY SELECTIVE-HEAD ENGINE LATHE

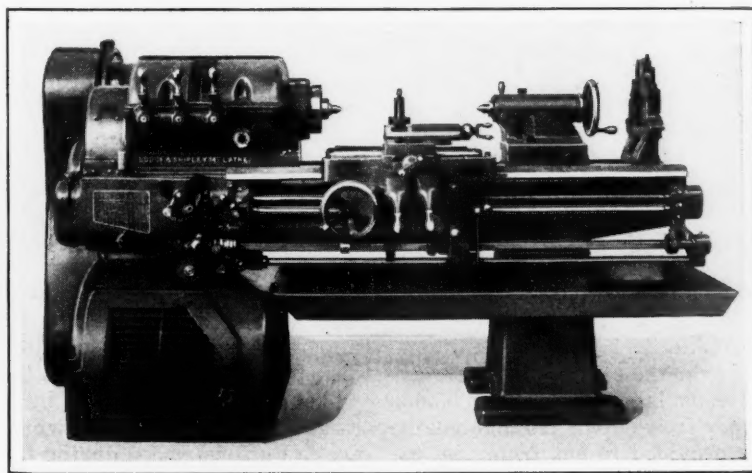
Booth No. 2-B-11

Improvements that are advantageous whether the machine is used in the tool-room or on production work, have been embodied in a 14-inch selective-

head engine lathe brought out by the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. This machine has a swing of 16 1/2 inches over the bed and 10 1/2 inches over the carriage. The distance between centers with the tailstock flush on a 6-foot bed is 2 feet 9 1/2 inches.

Twelve spindle speeds are available through gears sliding on splined shafts. There are only twelve gears and, besides the spindle, only two shafts in the headstock. These are carried in ball bearings. All of the mechanism is located in the lower section of the headstock. The gears revolve in oil, but supplementing the splash thus obtained, there is a pump that drenches the interior of the headstock, including the spindle bearings, which are of the white-metal type.

A new feature of the machine



Lodge & Shipley Selective-head Lathe with Lead-screw Reverse



is the reverse to the lead-screw, which is obtained by operating a lever at the right of the apron. This obviates the necessity of a reverse to the spindle except when the relieving attachment is used on very special jobs. The lead-screw and feed-rod can be disengaged so that only one of these members operates at a time. The double-nosed spindle, right-angle bearing of the car-

riage on the bed, chilled bedways, special construction of the compound rest which eliminates top slide overhang, and micrometer ball stop, are some features of previous machines that have been retained in the new design.

The motor is housed at the rear of the cabinet base and the starting equipment is enclosed in a compartment accessible through the door at the front.

tions from 10 to 220 revolutions per minute. The machine may be equipped with either a cross-sliding or stationary turret.

SELLERS HOB AND CUTTER GRINDING MACHINE

Booth No. 2-A-6

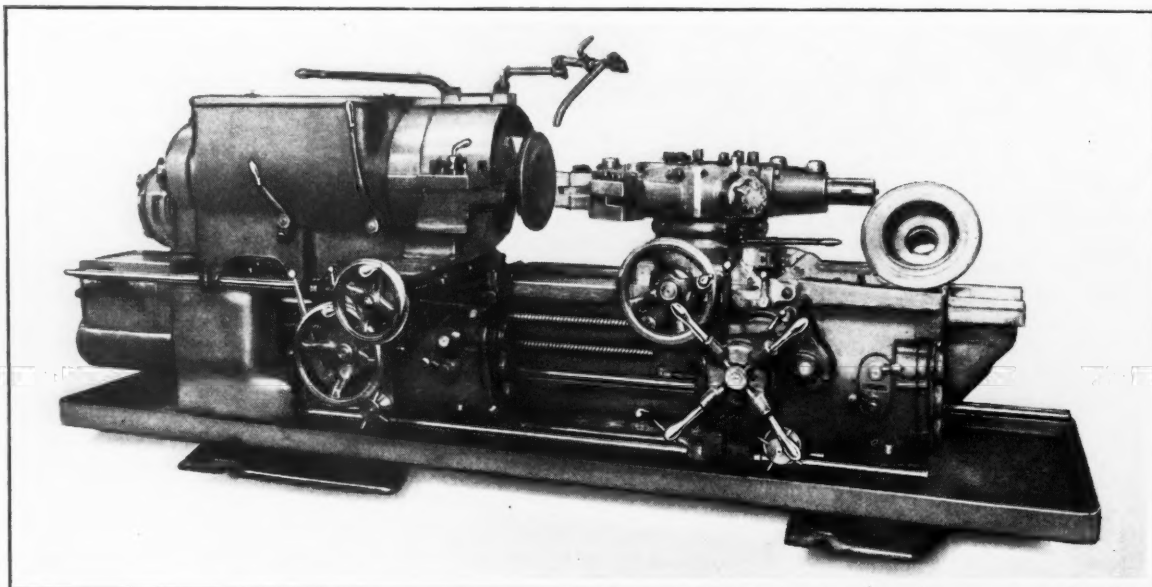
Straight and spiral hobs, milling cutters, reamers, taps, etc., in sizes up to 12 inches in diameter by 12 inches long, can be sharpened in a No. 1 automatic hob and cutter grinding machine placed on the market by William Sellers & Co., Inc., 1600 Hamilton St., Philadelphia, Pa. All feeding and indexing movements are

LIBBY-INTERNATIONAL HEAVY-DUTY TURRET LATHE

Booth No. 1-W-16

The "Libby-International" model 1H turret lathe brought out by the International Machine

the main spindle bearings and for the ways and slides. All shafts are mounted in ball or



Libby-International Heavy-duty Turret Lathe Equipped with Cross-sliding Turret

Tool Co., Indianapolis, Ind., has been designed especially with the view of providing a heavy machine that will have sufficient power and ruggedness to use the new tungsten-carbide tools, and to machine tough alloy steels and similar materials.

The machine is direct motor-driven, the motor being mounted on the end of the primary drive shaft, and connected to it by a flexible coupling. No belts, idlers, chains, or pulleys are employed. The entire machine is automatically lubricated, and the headstock gears, as well as the gears in both aprons, run in oil. There is an oil reservoir and filter for

roller bearings; even the feed dials are so mounted.

To insure rigidity, the legs and pan are cast integral, and the bed and headstock are also a one-piece casting, made of a nickel-chromium cast iron. One-piece hardened steel strips are dovetailed the entire length on both ways, without using screws.

The 1H machine swings work 24 inches in diameter over the ways and 22 1/2 inches in diameter over the carriage. The range of feeds is from 0.007 to 0.500 inch. Screw-cutting change-gears are provided to cut from two to thirty-two threads per inch. Eight spindle speeds give varia-

performed automatically, so that one man can operate five or six machines. Micrometers facilitate the setting of these movements.

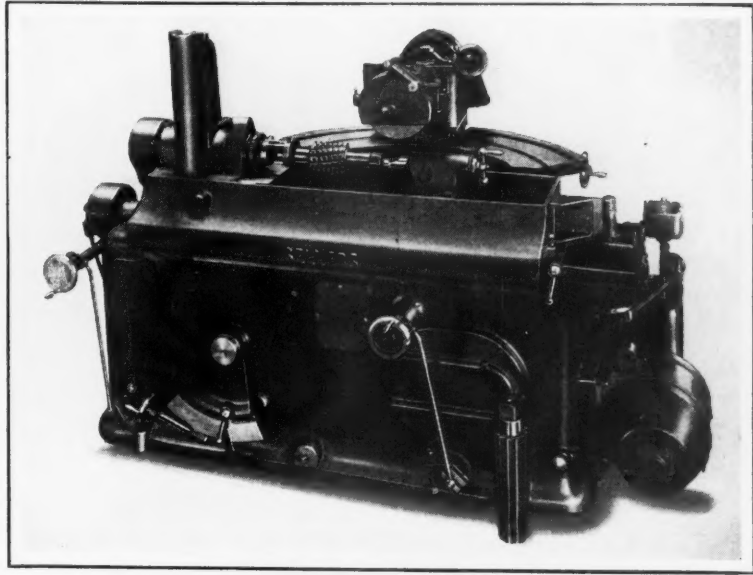
Indexing gears have been eliminated from the machine, making it possible to grind tools on both the cutting and return strokes. A sine-bar arrangement provides for the accurate grinding of right- or left-hand helix leads on hobs or cutters. A patented arrangement permits of grinding work to very large helix angles.

The carriage is driven by a crank and elliptical gear, which gives a uniform speed during the cut and an increased speed on the reverse. The 10-inch dish-



shaped emery wheel is driven by an independent motor and is mounted on a ball-bearing spindle. Vertical adjustment of the grinding wheel is made along a slide on the back of the bed which is inclined at the same angle as the face of the wheel. The grinding wheel head can be swiveled 45 degrees on either side, and can be moved in and out to provide any clearance angle desired.

Two motors drive the machine, one being direct-connected to the spindle and carried on the grinding head slide. The other motor is mounted on the right-hand end of the bed and operates the carriage-driving mechanism as well as the feeding and indexing mechanism. Either alternating- or direct-current motors of constant-speed type can be used. A gravity lubricating system is employed, and the filtered oil is returned to the reservoir by a pump connected to the main



Sellers Hob and Cutter Grinder for Sharpening Tools up to 12 Inches in Diameter by 12 Inches in Length

driving motor. The machine is adapted for wet or dry grinding.

Oil under a pressure of 500 pounds or more is delivered to the cutter tips to wash all chips out of the way and keep the tips cool. A power knock-off is provided at the butt end of each drill to automatically stop the spindle motor, the feed, and the oil, after the drilling operation is completed. The operator then raises the spindle to the starting position by using the capstan handle.

PRATT & WHITNEY DEEP HOLE DRILLER

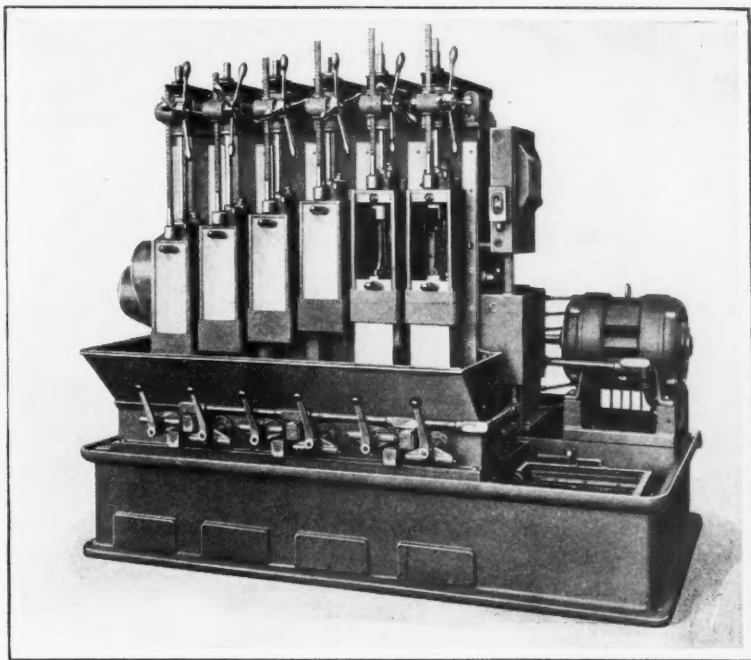
Booth No. 2-D-1

The rifle barrel method of drilling deep holes is employed on a six-spindle vertical machine recently developed by the Pratt & Whitney Co., Hartford, Conn. All six spindles are attended to by one operator, and the vertical design reduces the floor space required for such equipment. The machine is suitable for drilling holes the length of automobile connecting-rods to the wrist-pin bearings, for drilling the telltale holes in staybolts, etc.

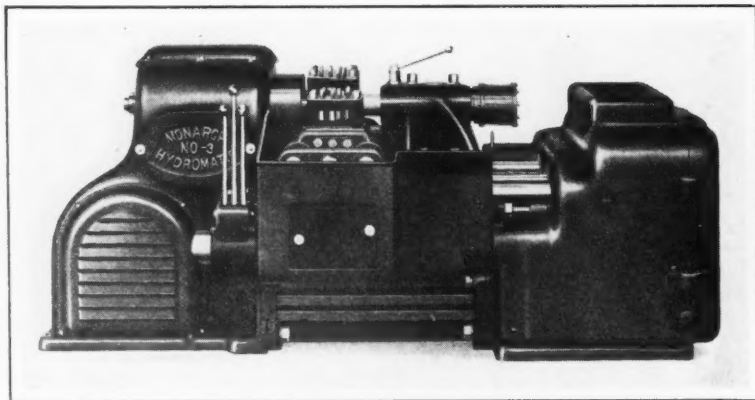
Six work-spindles and slides, together with their individual drives, are mounted on the column. The six drills remain stationary, and are mounted vertically on the bed beneath the spindles. On the rear of the bed is a compartment containing six high-pressure oil-pumps, one for each drill, and a large motor which drives all six pumps through gearing.

The work-holding mechanism differs according to the work, and the spindles rotate the work in the fixtures at the proper drilling speed. The six slides feed downward independently under

power to carry the revolving work to the stationary drills. Thus there are really six machines in one. The spindle units each have six ball bearings.



Pratt & Whitney Vertical-type Deep-hole Driller



Monarch "Hydromatic" with Carriages and Tool-slides Mounted on Round Bars

A slight additional pressure on this handle clears the lower holding fixture from the work. A friction knock-off functions automatically if any drill tends to

revolve due to sticking or clogging in a hole or striking a hard spot. A large portion of the machine is lubricated by a single-shot system.

MONARCH HYDRAULIC AUTOMATIC LATHE

Booth No. 2-W-21

An automatic lathe with both carriages and tool-slides hydraulically and automatically controlled has been brought out by the Monarch Machine Tool Co., Sidney, Ohio. In this machine, both the front and rear carriages may be equipped with a length feed and quick traverse, and the front and rear tool-slides may be provided with a cross-feeding travel and quick traverse. The complete cycle of both the carriages and tool-slides is automatic. Positive adjustable diameter and length stops insure duplication of cuts and a reduction in set-up time. The feeding rate can be varied automatically, and the changes can be effected almost instantly.

The rear end housing contains the hydraulic mechanism, which is easily accessible through large doors at the end. A two-horsepower motor in this housing drives two Oilgear hydraulic pumps.

The carriages slide on round steel bars—two 5 inches and two 6 inches in diameter. The tool-slides are also supported on round hardened steel bars with split tapered adjustable bushings to compensate for wear. The cross-feed hydraulic cylinder is

placed in the tool-slide between the two supporting bars. Either tool-slide can be instantly reversed and returned to the starting position from any point in the cycle, should the occasion arise. The tailstock spindle can be controlled manually, hydraulically, or pneumatically.

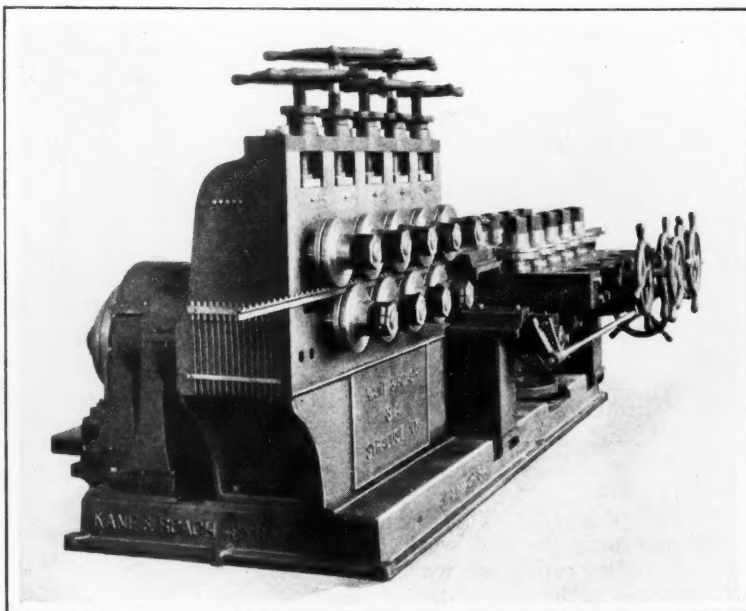
The spindle is worm-driven,

pick-off gears on the front of the headstock furnishing a ready means of securing any spindle speed up to 800 revolutions per minute. The high speed obtainable, combined with the rigidity of the machine, permits the use of tungsten-carbide tools. The spindle receives its power from a motor mounted in the base through a Monarch Edgemont multiple-disk driving clutch. A coolant pump of 80 gallons per minute capacity is mounted in the headstock housing and is also driven from the main motor. One lever starts the spindle, the coolant pump, and the hydraulic feeds on both carriages.

KANE & ROACH ROLL STRAIGHTENERS

Booth No. 3-W-14

A line of combination vertical and horizontal roll straighteners made in seven sizes, comparable in capacity with the corresponding sizes of the company's standard eight-roll straighteners, has been brought out by Kane & Roach, Inc., Syracuse, N. Y. In this new type of machine, both the horizontal and the vertical roll-shaft units are furnished with eight, ten, twelve or sixteen rolls each, and can be supplied in any combination of units.



Kane & Roach Horizontal and Vertical Roll Straightener



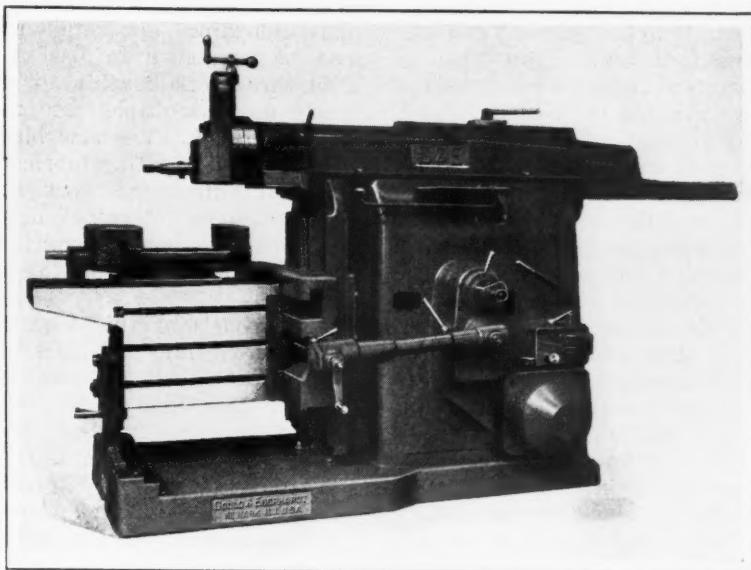
These machines are especially intended for use when a high degree of accuracy and straightness is required, as the combination of horizontal and vertical rolls enables a larger percentage of material to be straightened within the required limits in one pass through the rolls than would otherwise be possible. The manufacturer has standardized on the Alemite lubricating system, but any other system of lubrication can be supplied, in accordance with the customer's specifications.

These machines have a delivery speed of from 60 to 300 feet per minute. The rolls are designed for handling round, flat, square, U, Z, hexagon or octagon bars, angle-irons, I-beams, railroad rails, pipe, and window casings, as well as special shapes when required.

GOULD & EBERHARDT SHAPER

Booth No. 1-B-6

The 36-inch manufacturing type shaper here illustrated, has recently been brought out by Gould & Eberhardt, Newark, N. J. It is of the same general construction as the 24-, 28-, and 32-inch manufacturing shapers built by this concern.



Gould & Eberhardt Manufacturing-type Shaper of Greater Capacity than Previous Models

The rapid power traverse can be operated at all times in a direction opposite to that in which the feed is set. The built-in motor is coupled direct to the transmission drive shaft. The work slide is of improved design, having large bearing surfaces. Pressure lubrication is provided for all important moving parts, including the linkage system. The table support has a positive locking device. Dual control is provided for operating the hand

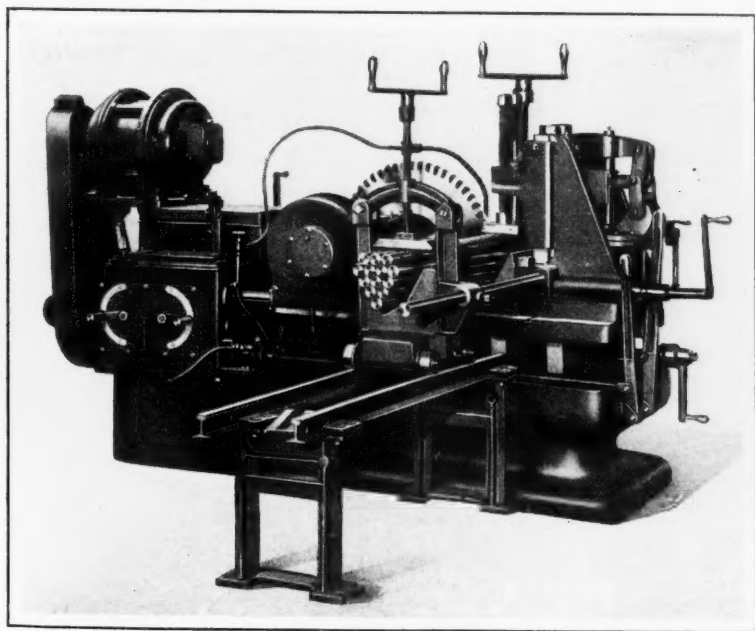
feed on the table and at the rail. There is a single cam feed, positive in action.

"COBLY" METAL-SAWING MACHINE

Booth No. 2-C-12

All driving shafts, the saw arbor and the driving pulley of the No. 55 metal-sawing machine brought out by the Cochrane-Bly Co., Rochester, N. Y., are mounted in roller bearings and the worm thrust is taken by a Timken high-angle thrust bearing. This machine is driven through a friction clutch that is operated from either a front or side position, and a sliding gear transmission which gives four cutting speeds of 42, 60, 75 and 90 feet per minute. Sixteen feeds are available, from 1/2 to 10 inches per minute, and any feed may be obtained with any one of the four speeds available.

The feed-screw is mounted above the ways in line with the center of the saw arbor, and close to the blade in line with the cutting and frictional resistance so as to eliminate any tendency to lift or cant the carriage and cause vibration or a variation in feed. The feed-screw nut is provided with adjusting screws to compensate for wear. Lock-nuts permit compensation for wear at the point where the feed-screw



"Cobly" Metal-sawing Machine which is Equipped Throughout with Roller Bearings



connects to the gear-box housing. The feed clutch can also be operated from either front or side working positions. Adjustable stops regulate the length of carriage travel, tripping the feed and giving an automatic quick return of the carriage. The feed can be stopped at any point without going into reverse and without stopping the machine. A flexible clutch in the feed-gear train slips under excessive load and a shear pin in the feed-screw gear provides double safety.

The machine may be fitted with an air clamp in place of the standard screw vise. The air equipment includes an 8-inch cylinder and operates through compound toggle links which give a heavy pressure and practically instantaneous operation. The stock feed consists of a support truck on rails, and a rack-and-pinion mechanism that is operated with a crank. Gage collars can be set to suit the length of the pieces to be cut. Power-operated stock-feeding

and unloading apparatus can also be furnished to feed the stock through the machine either singly or in multiple, into unloading trucks. The saw blade is flooded with cutting lubricant where it enters the work. A silent-chain or "Texrope" drive may be used for transmitting power from the motor to the machine.

Two models of this machine are built, Nos. 55 and 55-B, respectively. The No. 55 machine has a 24-inch diameter saw and possesses a capacity for cutting round bars up to 7 1/2-inch; square bars up to 6 1/2-inch; I-beams up to 10-inch; and rectangular sections up to 5- by 10-inch. This model weighs 4500 pounds. The No. 55-B machine is equipped with a 26-inch blade and has a capacity for cutting round bars up to 8 1/2-inch; square bars up to 7 1/2-inch; I-beams up to 12-inch; and rectangular sections up to 7- by 10-inch. It has a weight of 4600 pounds.

work delivery conveyor. The escapement attachment is intended for use in connection with long hexagonal- and square-head bolts, as well as bolts and screws having odd-shaped heads, as, for example, rim, plow, and step bolts.

The attachment is built into the magazine unit, as shown at A, Fig. 2. It releases one bolt at a time at the end of the magazine, thereby relieving the bolt being transferred to the chuck turret from the weight of the bolts in the magazine and preventing interference of bolt heads. The attachment covers the entire work range of the machine, which includes bolts from 5/16 to 3/4 inch in diameter and from 1 to 6 inches in length.

The work delivery conveyor, which carries the finished bolts to handling boxes, is shown near the bottom of the machine in Fig. 1. An oscillating motion is imparted to the conveyor to move the bolts slowly to the handling boxes, during which time most of the coolant drains off the bolts through perforations in the conveyor. The coolant collects in a trough underneath the conveyor and returns to the sump in the bed. Small chips are also separated from the bolts and drop through the conveyor perforations.

LANDIS IMPROVED AUTOMATIC FORMING AND THREADING MACHINE

Booth No. 1-B-8

Improvements recently incorporated in the automatic forming and threading machine built by the Landis Machine Co., Waynesboro, Pa., include a new escapement attachment and a

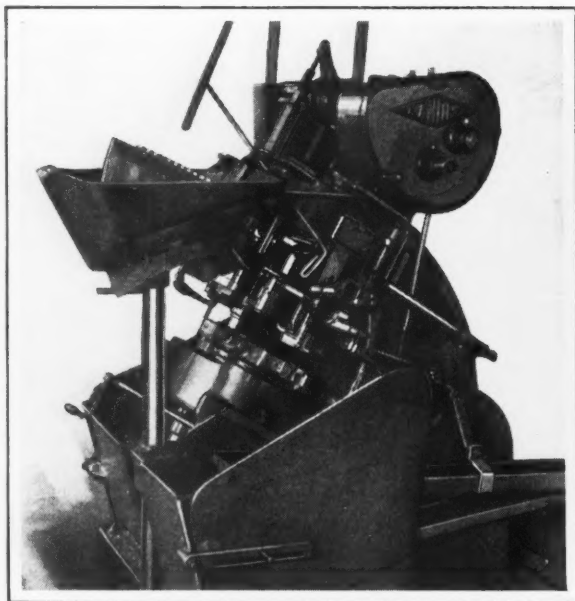


Fig. 1. Landis Forming and Threading Machine with Work Delivery Conveyor

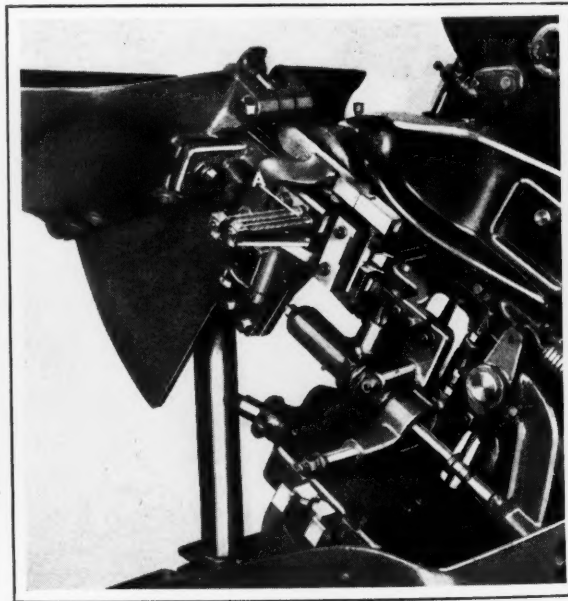


Fig. 2. Escapement Attachment Located on Landis Machine as Shown at A



While the illustration shows the conveyor installed for delivering bolts at the rear of the

machine, it can readily be arranged for delivering them at the front.

wheel graduated to 0.001 inch, which is mounted on the shaft carrying the elevating hand-wheel. The weight of the machine is about 5000 pounds. Power is furnished by a 7 1/2-horsepower motor.

WALKER SINGLE-STROKE SURFACE GRINDER

Booth No. 2-W-8A

The model D single-stroke surface grinding machine built by the O. S. Walker Co., Inc., Worcester, Mass., is now made with a tilting table and adjustable wheel-head carrying member. In the illustration, the tilting table, which carries the chuck bracket, is shown in the maximum tilted position, and the wheel-head carrying member is shown moved back to its farthest position, the maximum rearward travel on the slide being 4 inches. With these adjustments, the machine has a capacity for grinding cutters and saws with hubs up to 6 inches in diameter. In addition to the accurate grinding of flat work, the machine can also be set for concave grinding.

In operation, the work to be ground is placed on the rotary chuck. As the wheel-head feeds down, it automatically closes the electric circuit through the chuck, operates a clutch which starts the chuck rotating, and

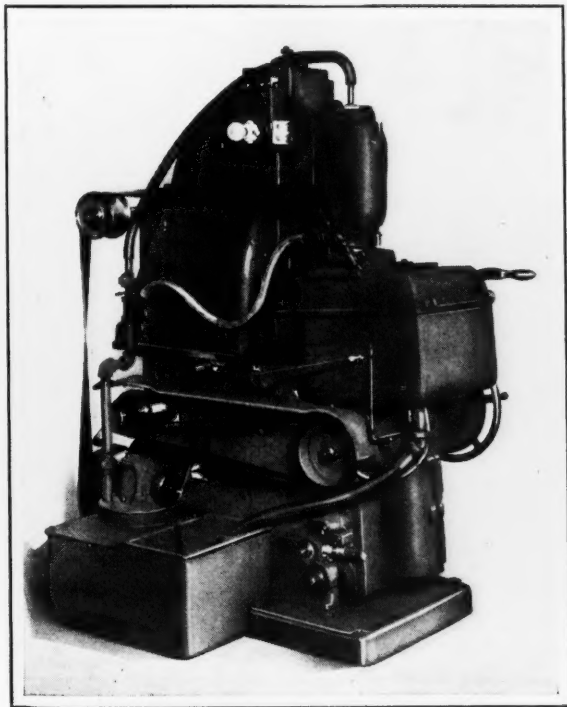
brings the grinding wheel in contact with the work. The removal of stock continues until the down movement of the wheel-head is arrested by a fixed stop. When the grinding operation is completed, the raising of the wheel-head automatically stops the chuck rotation, breaks the electric circuit through the chuck, and for an instant closes this circuit in the opposite direction, thereby demagnetizing the chuck face and facilitating the removal of the work.

A cup-shaped grinding wheel having an outside diameter of 8 inches and a 5 1/2-inch hole is mounted on the ball-bearing spindle. A 7/8-inch hole through the spindle provides for the delivery of water inside the grinding wheel. Accurate adjustment of the magnetic chuck to compensate for wear of the grinding wheel or for the removal of a predetermined amount of stock from the work is provided by a

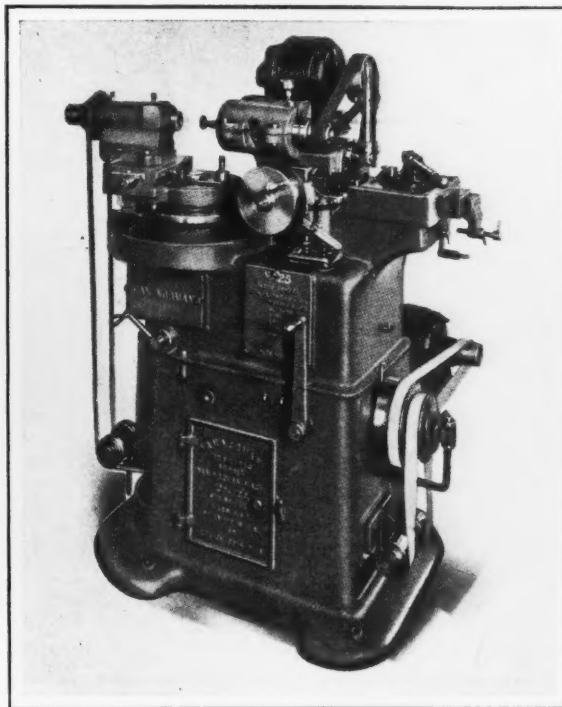
VAN NORMAN OSCILLATING GRINDING MACHINE

Booth No. 1-A-14

The No. 25 type oscillating grinder recently brought out by the Van Norman Machine Tool Co., 150-190 Wilbraham Ave., Springfield, Mass., is completely motor-driven. Two motors are used, one for driving the wheel-head and the other for driving the work-head and oscillating mechanism. Full control over the oscillating movement and the rotation of the work-head is secured through a single lever by means of which it is possible to stop and start the machine with one motion. The machine is ball-bearing equipped, having a total of thirty-two ball bearings. The various new features practically double the production, as compared with the older type machines manufactured by the company.



Walker Single-stroke Surface Grinding Machine



Van Norman Motor-driven Oscillating Grinder



PRATT & WHITNEY JIG BORING MACHINE

Booth No. 2-D-1

Tables with tops measuring 24 by 48 inches and 24 by 60 inches may be provided on the models No. 3 and No. 3-A jig boring machines recently developed by the Pratt & Whitney Co., Hartford, Conn., to enable larger work to be handled than can be accommodated on the smaller machines. On the No. 3 model the longitudinal table travel is 42 inches, and on the No. 3-A, 54 inches. The transverse table travel on both machines is 24 inches, and the maximum and minimum distances between the table top and the spindle nose, 30 and 4 inches, respectively. The travel of the head on the column is 17 inches, and the travel of the spindle quill, 9 inches.

The new machine embodies the same fundamental system of locating work as the smaller jig borers, using end measures, inside micrometers, and dial indicators. Work can be located to 0.0001 inch, bored and then checked without changing the set-up. A linear scale has been

provided, for setting roughly to the larger dimensions as quickly as possible.

The machine is built in a motor-driven style only. Electrical improvements include lights over each dial indicator and above the work. A switch connected to the spindle clutch lever starts and stops the drive

motor as the clutch is operated. The motor itself has four speeds, which, through the back-gears, gives eight spindle speeds. It is easy to shift from a high to a low speed in one movement of a single lever.

Other features include forced-feed oiling throughout, Maag gearing, and broad bearing surfaces. The two models weigh 15,000 and 15,500 pounds, respectively.

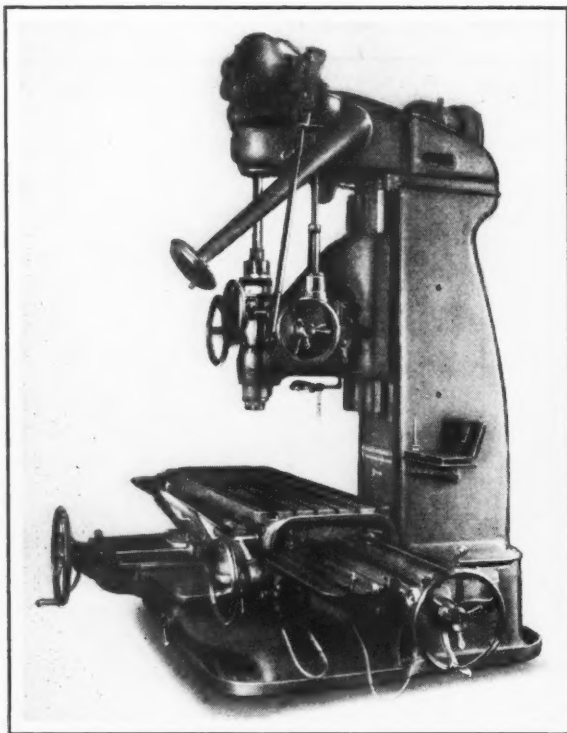
HYDRAULIC PRESS MANUFACTURING CO.'S HIGH-SPEED PRESS

Booth No. 3-W-4

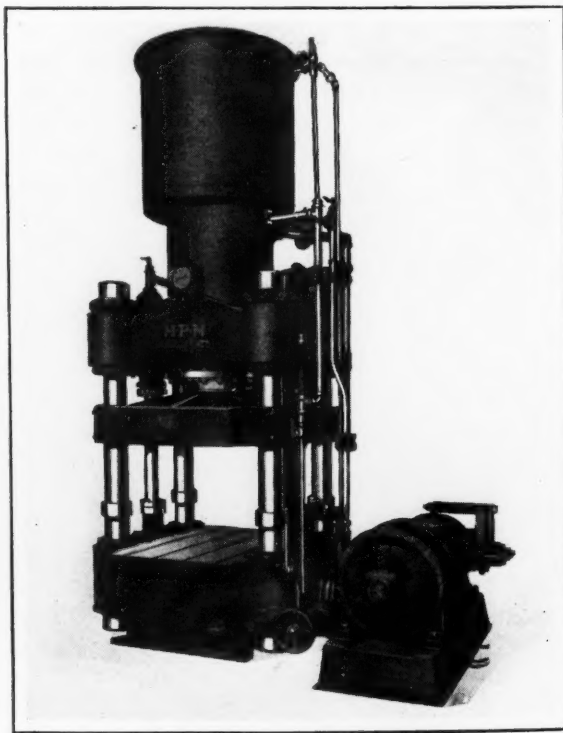
Automatic action, obtained through the use of newly developed hydraulic control mechanisms, is a feature of the heavy-duty forming press recently brought out by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. Forming and drawing of heavy-gage metal are included in the various classes of work for which this machine is designed. The necessary fluid pressure is produced by a motor-driven radial type of hydraulic pump. The operating pressure is adjustable

within wide limits up to the maximum capacity of 500 tons. The platen and bed each measure 36 inches across by 60 inches front to back. The maximum opening is 30 inches, and the maximum travel, 18 inches. The machine has an operating speed of ten cycles per minute on a working stroke of 6 inches.

When the controls are set for semi-automatic operation, the tripping of a starting lever or pedal causes the press platen to move downward at a fast closing



Pratt & Whitney Jig Boring Machine of Larger Capacity than Previous Models



H.P.M. Hydraulic Press which Operates at Ten Cycles per Minute on a Six-inch Stroke



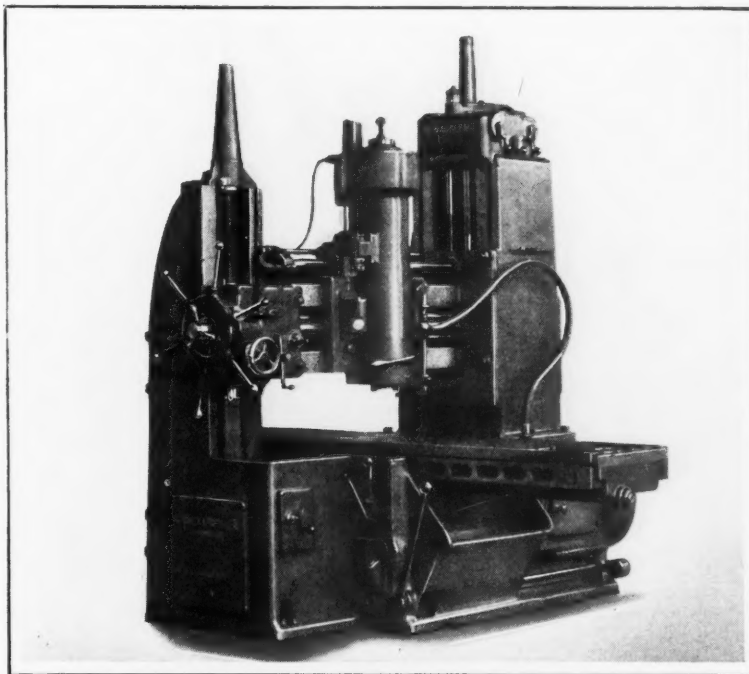
speed. It then automatically changes to a slower full-load speed, reverses when the pressure is built up to a predetermined limit, and returns or opens at a fast speed, stopping at the upper position. When the controls are set for full automatic operation, the cycle is the same, except that the machine operates continuously and does not stop at the end of the upward stroke.

"SABECO" BEARING METAL

Booth No. 5-W-6

A bearing bronze in various grades and forms is being placed on the market by the Frederickson Co., Saginaw, Mich., under the name of "Sabeco." It is claimed that this bearing metal is non-scoring, non-seizing, non-corrosive, and acid-resisting, and that it will not burn or pound out. The metal is an alloy of copper, tin, and lead, with an exceptionally high percentage of lead.

This bearing metal is obtainable in four different forms, namely, ingots, solid or cored cast bars, rough castings made from patterns, and machined bushings. Four grades are obtainable, as follows: No. 5, for light or medium loads or water lubricated bearings; No. 9, for heavy loads such as are required in the construction of the aver-



"Mil-Waukee-Mil" with Bridge or Rail that can be Adjusted Vertically

age machine tool; No. 11, for extra heavy unit pressures; and No. 11-HG for worm-wheels, clutch-shifter shoes, forging machine slides, etc.

The tensile strength of these metals ranges from 22,600 to 27,300 pounds per square inch, and the elastic limit, from 14,800 to 19,600 pounds per square inch.

Bearings consisting of seamless steel tubing lined with "Sabeco" metal have also been brought out by the concern.

BRIDGE TYPE VERTICAL "MIL-WAUKEE-MIL"

Booth No. 2-B-7

The latest addition to the line of "Mil-Waukee-Mil" machines built by the Kearney & Trecker Corporation, Milwaukee, Wis., is the bridge-type vertical machine illustrated, which is adapted for face-milling, die-sinking, routing, profile milling, jig and fixture machining, and other classes of work where several surfaces are to be milled on different planes. The bridge or rail of this machine can be raised or lowered by power at the rate of 25 inches per minute. After a vertical adjustment has been made, the rail can be locked in

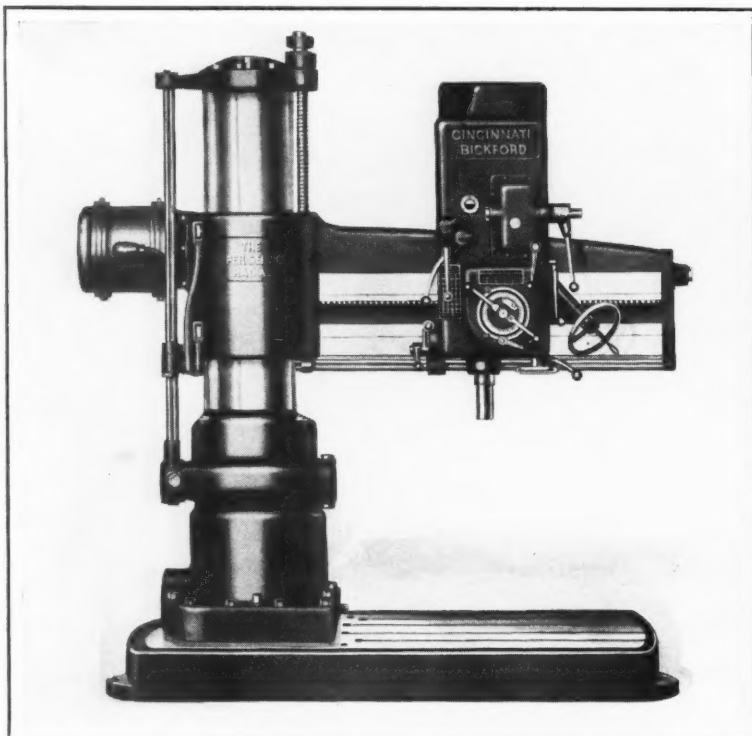
position. The saddle carrying the vertical ram and spindle, can be traversed a distance of 24 inches either in or out across the table by means of the power feed or by the power rapid traverse, which is at the rate of 100 inches per minute.

The spindle ram is provided with a power down feed of 7 inches; it can also be run up and down with either a slow or quick hand feed, graduations to 0.001 inch being provided for the slow movement. Four-position micrometer stops can be supplied for the vertical ram movement.

The table is 22 inches wide, and work up to 46 inches in width will pass between the housings.

The bridge, saddle, and spindle movements are primarily controlled from the front of the bed by the same levers that are used on other "Mil-Waukee-Mil" machines. Levers for engaging the feed movements are located on the gear-box on the bridge. Engagement of the saddle feed or power rapid traverse is effected by means of the vertical lever on the feed-box on the bridge. The power feed for the saddle is obtained through the standard feed-box furnished on all "Mil-Waukee-Mils." It is possible to engage both the saddle cross-feed and the table feed simultaneously for diagonal milling. Feeds covering a range of from either 1/2 to 20 inches per minute or from 1 to 40 inches per minute can be provided.

The power down feed rates for the ram are one-quarter the feed rates shown on the feed plate; thus the fine feeds necessary for boring operations are available. The spindle drive is through the standard speed-box at the top of the main upright and either through pick-off gears or a quick-change gear-box.



Cincinnati-Bickford Radial Drill with Centralized Control on the Head

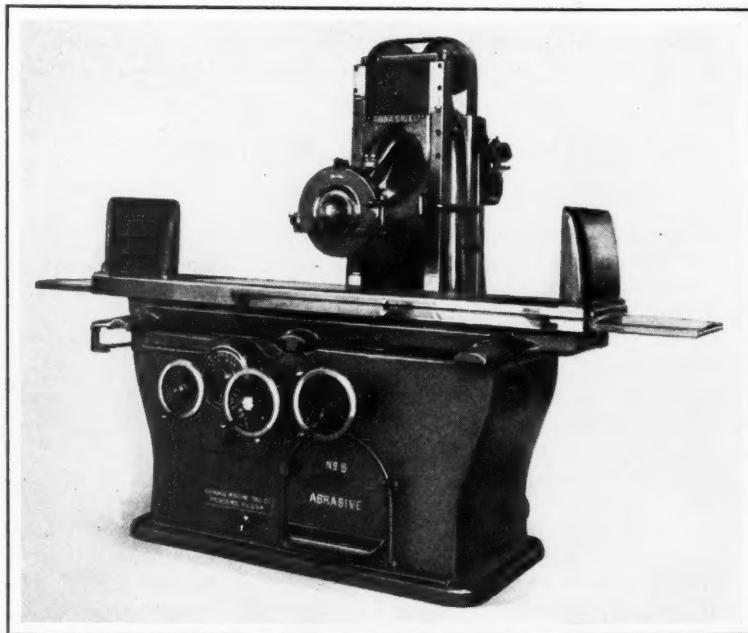
CINCINNATI-BICKFORD RADIAL DRILLING MACHINE

Booth No. 2-A-1

Close grouping of the controls on the head is one of the principal features of an 11-inch column machine recently added to the line of "Super Service" radial drilling machines built by the Cincinnati Bickford Tool Co., Oakley, Cincinnati, Ohio. All speed and feed changes are made in the head through selective sliding gears. The clamping of the column is controlled at the head, as are also the raising and lowering of the arm. An interlocking arrangement prevents two conflicting movements from being engaged at one time.

This machine is built with a 3- or 4-foot arm, and with twenty-four speeds in the head ranging from 29 to 1850 revolutions per minute. The lubricating system has been designed to operate over a long period of time without attention. The complete drive from the motor to the spindle nose is equipped with ball and roller bearings. The head is supported by an adjustable roller-bearing gib on a hardened steel arm-way, so that it can be moved

rapidly and with little effort. There is a rapid hand traverse of the head. The drive is by a constant-speed motor.



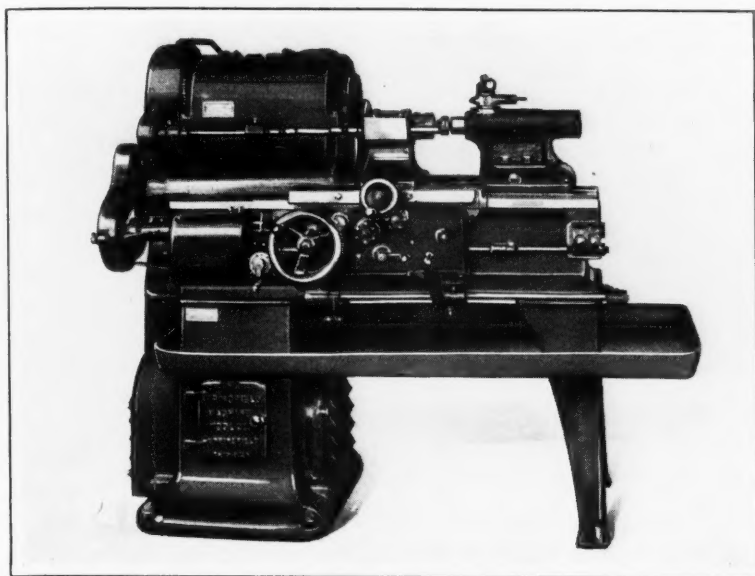
Abrasive Surface Grinding Machine of Improved Design

ABRASIVE IMPROVED SURFACE GRINDER

Booth No. 2-W-5

A wider machine bed, increased table travel, and two flat ways for the three-point saddle bearing are some of the improvements incorporated in the No. 5 abrasive grinding machine recently redesigned by the Abrasive Machine Tool Co., East Providence, R. I. The bed of the machine has also been changed so that it sweeps inward to the floor, instead of outward, as was the case with the previous machine described in December, 1927, *MACHINERY*, page 312.

The space for the motor in the base has been increased, and a larger coolant tank has been provided. Improvements have also been made in the oil control, wet grinding attachment, automatic cross-feed, and the handwheel assembly for the table travel. A two-speed gear-box and a spiral rack-and-pinion table drive are other new features, as well as a center saddle guide and support that is 28 1/2 inches long. A longitudinal table travel of 48 or 60 inches can be furnished, the automatic transverse movement being 14 inches. The wheel-head can be adjusted 14 inches in a vertical direction.



Springfield Lathe Arranged for Machining Aluminum Pistons
with Tungsten-carbide Tools

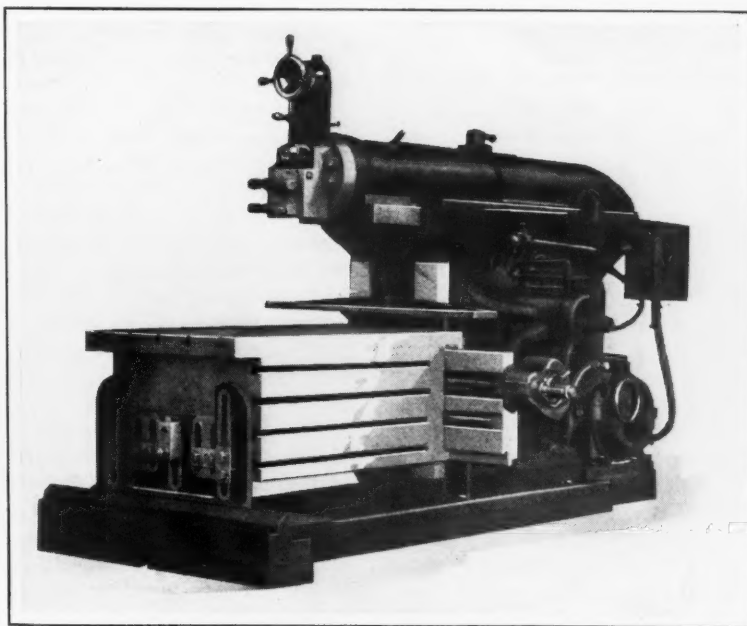
SPRINGFIELD LATHE ADAPTED TO USE TUNGSTEN- CARBIDE TOOLS

Booth No. 1-W-7

Tungsten-carbide tools machine aluminum pistons at a cutting speed of approximately 1100 feet per minute on a lathe recently improved by the Springfield Machine Tool Co., 631 Southern Ave., Springfield, Ohio, to permit the use of the new high-speed cutting alloys for light cuts. One of the main changes is in the drive, power being transmitted from the motor to the main driveshaft by means of an endless belt, and from this driveshaft to the spindle through a silent chain inside of the headstock. Therefore, there is only one spindle speed, but various speeds can be obtained by substituting different sized motor and upper-drive pulleys. There are no gears at all running in the head. Timken tapered roller bearings are used to withstand the spindle speed and the heat generated.

One particular feature of the operation illustrated is that the piston being turned is relieved on both sides of the wrist-pin bearing by means of the small relieving attachment shown. The piston is finished in the lathe instead of by a grinder.

Other geared-head engine lathes which are built by the concern in sizes of from 14 to 26 inches, can be similarly arranged for operation at high speed to suit the new cutting tools.



"Super-Dreadnaught" Shaper Equipped with a Table that
Accommodates Large and Odd-shaped Castings

OHIO "SUPER-DREAD- NAUGHT" SHAPER

Booth No. 2-D-8

On the 36-inch "Super-Dreadnaught" shaper being introduced to the trade by the Ohio Machine Tool Co., Kenton, Ohio, an unusually large table permits the clamping of odd-shaped work or pieces too large for the ordinary shaper vise. The top of the table illustrated measures 48 $\frac{7}{8}$ inches in length, including the saddle, and 30 inches in width. Small work can be held in a vise, but the machine is primarily designed for use in shops manufacturing large dies and fixtures and machining castings of all kinds.

The maximum distance between the top of the regular table and the ram is 22 inches, but by the use of a drop-table this distance can be increased to 30 $\frac{1}{2}$ inches. A filler block can be provided for use on the drop-table when jobs are being handled that do not require the increased height. The unusually heavy table support furnished is equipped with the jack that is provided on all shapers built by the concern. This jack equalizes the weight between the rail and the table support, preserving



alignment and reducing wear on the back of the rail.

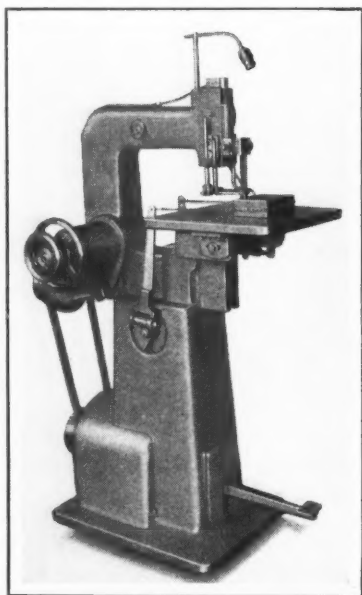
Another feature of the machine is the length of ram remaining in the column even on an extended stroke, this length being 56 inches. The ram is of double-wall section and the head has a swivel 13 inches in diameter. The clutch, brake, speed

and feed controls, are all located within a 12-inch radius, which makes for convenient operation. Automatic lubrication is provided. An automatic power down-feed can be furnished, as well as a rapid power traverse and power elevation. A revolving table with a tilting top can also be supplied if required.

OLIVER HEAVY-DUTY DIE-MAKING MACHINE

Booth No. 1-W-6

Work up to 3 inches thick can be both filed and sawed on a heavy-duty die-making machine recently developed by the Oliver



Oliver Die-making Machine for Filing and Sawing Work Up to Three Inches Thick

Instrument Co., 1410 E. Maumee St., Adrian, Mich. This machine is intended for precision work on dies, tools and similar parts. The mechanism for holding and reciprocating the files or saws consists of two rams, one above and one below the table. These rams are oscillated in unison by arms and a connecting-rod.

All gears, and the mechanism for operating the rams, are enclosed in an oil-tight body and a geared oil pump supplies lubricant to all bearings except those of the rams. The bearing surfaces of the rams are hardened and ground steel plates which can be adjusted to insure accu-

rate alignment. An air pump enclosed in the body serves to keep the work clear of chips.

Hold-down fingers, saw guides or other attachments are secured to the upper ram housing, leaving the table clear for the manipulation of the work. The required feeding pressure may be applied by means of a foot pedal. Power is supplied by a 1-horsepower motor located in the base of the machine. The table is 16 inches square and can be tilted in four directions.

GENERAL ELECTRIC PLANER CONTROL

Booth No. 4-A-2

All the automatic operations of a planer may be governed from a pendant push-button station which the General Electric Co., Schenectady, N. Y., has just placed on the market for use in combination with a new magnetic controller. The controller panel is shown in Fig. 1, and the push-button station in Fig. 2. The panel is of standard design with an added section on which are mounted relaying contactors that are governed by the push-button station. This extra section may be added to standard pedestal-type magnetic controllers now in service.

The pendant push-button station has four buttons marked "Automatic," "Out," "Return," and "Stop." The "Start" button is located on the controller itself, but, after pressing the "Stop" button on the pendant station, operation may be resumed by pressing the "Automatic" button. The "Stop" button is at the bottom of the pendant station

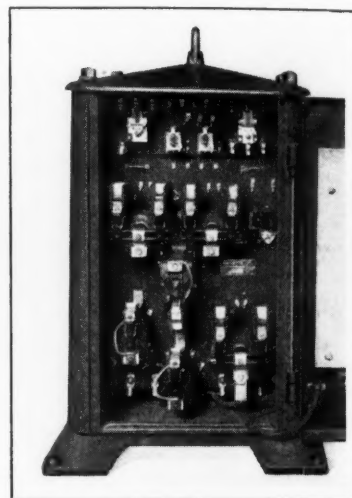


Fig. 1. Planer Controller Made by the General Electric Co. for Use with a Pendant Push-button Station

where it is readily accessible from all angles. If the wrong button should be pressed for any given position of the planer, the operation of the machine remains unchanged.

A particular advantage of the control is that in machining large castings it is not necessary for the operator to climb out of the casting every time he desires to control the operation, since he has full control from the pendant push-button station.

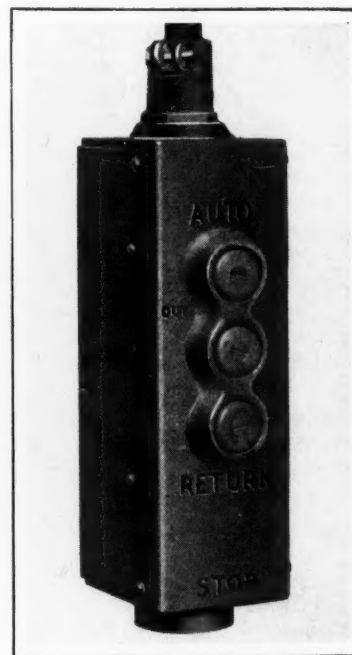


Fig. 2. Pendant Push-button Station for Planer Operation



IMPROVEMENTS FOR AMERICAN RADIAL DRILLING MACHINES

Booth No. 2-D-3

Several improvements have recently been developed by the American Tool Works Co., Cincinnati, Ohio, for their line of radial drilling machines. The unit arm clamping and elevating mechanism shown in Fig. 1 is provided with a single lever by means of which the arm can be either unclamped or clamped to

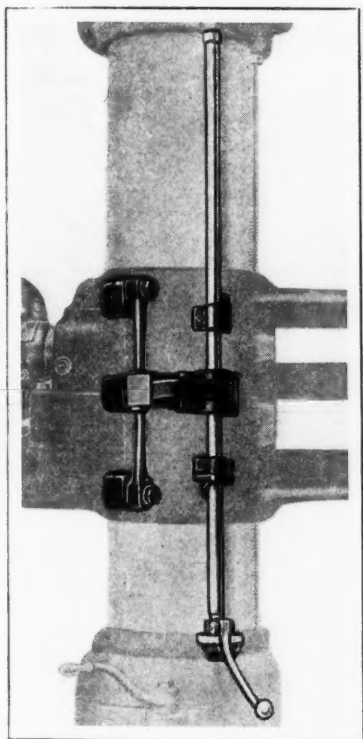


Fig. 1. Power Clamping and Elevating Mechanism of American Radial Drills

the column sleeve, and the elevating mechanism engaged for raising or lowering the arm by power.

Another improvement is the electric power-traverse unit for the head, which is shown in Fig. 2. This is an independent unit that is operative whether or not the machine is running. A small lever at the front of the unit operates the motor control switch and automatically disconnects the hand traverse mechanism before starting the electrical power traverse. The motor runs only when the head is being traversed, the electrical circuit

being disconnected when the operator releases the control handle. Automatic stops guard against accidental over-travel of the head.

An electrical speed control that is not illustrated has also been developed. This mechanism is mounted on the right-hand side of the head within easy reach. The control of speeds provided by a rheostat is accomplished through a star-shaped knob which actuates the speed adjusting mechanism through a sprocket and chain. This control mechanism eliminates the splined rod and bevel gears formerly employed.

Relocation of the feed control levers is another improvement recently made on the 19-, 22-, and 26-inch column machines. These levers are now placed at the extreme lower left-hand corner of the head where they are within convenient reach of the

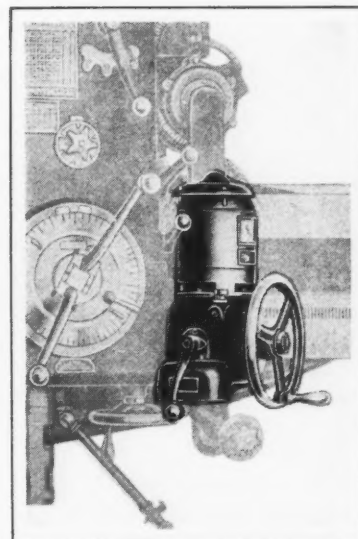


Fig. 2. Independent Head Power-traverse Unit

operator. The entire range of twelve feeds is secured through these two levers, and the correct lever position for any desired feed can be determined by reference to the feed index plate attached to the front of the head.

HANNIFIN AIR-OPERATED EQUIPMENT

Booth No. 5-B-9

Two air-operated rivet presses, a hydro-pneumatic broaching press and an air-operated lathe chuck equipped with a ball bearing for piloting boring bars, will constitute the new equipment to be exhibited by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill. The rivet presses are built in vertical and horizontal types as illustrated at the left and middle, respectively, in Fig. 2. One of their principal features is that not a moving part, with the exception of the ram, is exposed. Only five points require lubrication and Alemite fittings are provided for this purpose. The air cylinder is of the double-acting type and the piston is so constructed that it can be adjusted from the outside to compensate for wear.

The mechanism of each press operates on the wedge principle, a wedge of predetermined angles being driven between two roller bearings mounted in the frame and a roller mounted in the top

of the ram. Forward movements of the piston drive the wedge between the rollers and cause downward movements of the ram. The wedge is provided with angular surfaces in two

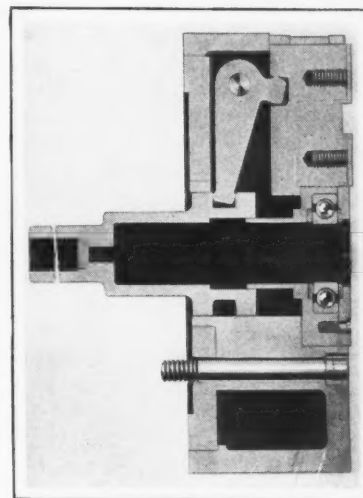


Fig. 1. Air-operated Lathe Chuck Equipped with Ball Bearing to Pilot Boring-bars



stages. At the beginning of the ram operation, a comparatively steep angle is employed to give a rapid approach to the work. Then, for the final riveting stroke of the ram, the wedge surface angles are substantially different so as to provide maximum power.

These presses can be used for heading either hot or cold rivets. They are also adaptable to other squeezing operations that require comparatively high power through a short ram movement. Many punching, perforating and assembling operations can be performed. The vertical machine

piston by means of a cast steel cross-arm. Speeds are controlled by the transfer of oil from the top to the bottom of the oil cylinders. During the power stroke, the oil passes through a needle valve which can be regulated to give any desired ram speed, while during the return stroke the oil passes through a swing check which permits the ram to return to the top position at full speed. This machine is intended for operations that can be performed with broaches not exceeding 12 inches in length.

The air-operated lathe chuck equipped with a ball bearing for

mazoo, Mich., for grinding the correct radius on both new and worn railroad journal wedges. This machine consists primarily of a motor-driven grinding spindle, a profile block machined to the proper radius for journal wedge grinding, and a chuck for holding the wedges. A feather key, which fits in guiding slots planed in the top of the profile block, guides the chuck under the wheel. After one section of the wedge radius is ground, the chuck is moved over on the profile block until the feather key slides into the next slot. This operation is repeated until

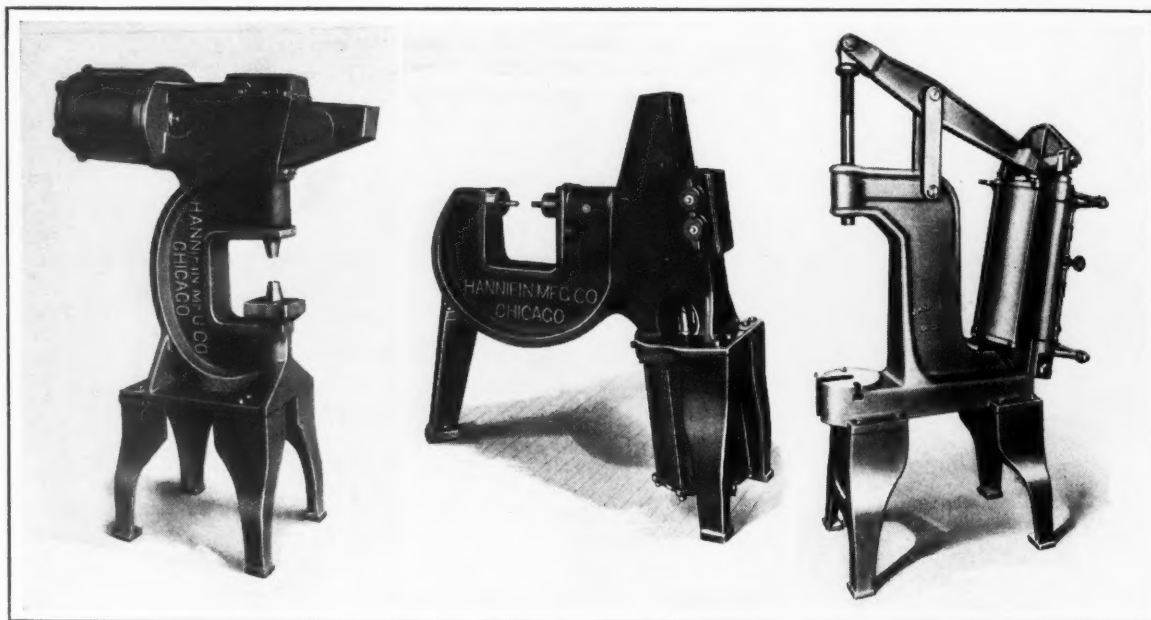


Fig. 2. Hannifin Vertical Rivet Press, Horizontal Rivet Press and Hydro-Pneumatic Broaching Press, Reading from Left to Right

is available in thirteen sizes ranging in pressure from 5000 to 80,000 pounds, and the horizontal machine in eight sizes having the same power range as the vertical types. Two portable types are available, one with a pressure of 10,000 pounds and the other of 20,000 pounds.

The hydro-pneumatic broaching press illustrated at the right in Fig. 2 is somewhat similar in construction to the machine described in May 1927 MACHINERY, page 713. It is equipped with a control consisting of two small hydraulic cylinders mounted on each side of the air cylinder. The piston rods of the hydraulic cylinders are connected to the air

piloting the tool bar in boring operations is shown in Fig. 1.

This improvement is intended to eliminate the difficulties sometimes obtained in boring operations due to the large amount of friction developed when a non-rotating bushing is employed in the center of a chuck for piloting the bar.

HILL-CURTIS GRINDING MACHINES

Booth No. 2-W-8

The F-B journal wedge reclaimer shown in Fig. 1 has recently been placed on the market by the Hill-Curtis Co., Kala-

as much of the surface is ground as is necessary to obtain the proper radius.

The 18- by 3-inch straight-faced wheel on the left-hand end of the spindle can be used for general-purpose grinding. All cooling air which reaches the motor passes through an air cleaner. The machine is equipped with ball bearings or Timken tapered roller bearings, as preferred.

The "Rite Speed" grinding machine shown in Fig. 2, also recently placed on the market by the same company, is designed to allow a maximum working clearance around the spindle. A single lever serves to start and

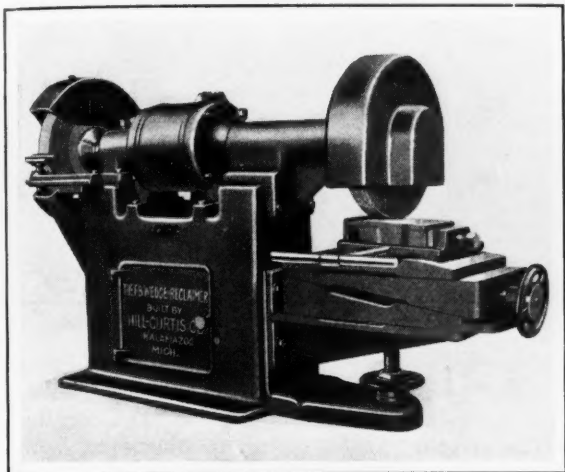


Fig. 1. Hill-Curtis Grinder for Reclaiming Railway Journal Wedges



Fig. 2. "Rite Speed" Grinder Designed for Maximum Working Clearance

stop the motor and to operate the brake that stops the rotation of the spindle. Power is transmitted from the motor in the base to the spindle by multi-vee belts. The machine can be equipped for any desired speed by providing the motor with a pulley of the proper size. The spindle of this machine is also supported in four ball bearings or Timken tapered roller bearings, as preferred.

U. S. MULTI-SPEED BUFFER

Booth No. 1-A-15

Four different wheel speeds, to meet the requirements of various classes of polishing and buffing work, are obtainable on the

buffing machine illustrated, which has been recently developed by the United States Electrical Tool Co., 2477 W. Sixth St., Cincinnati, Ohio. The four speeds range from 2000 to 3000 revolutions per minute, and are obtained by means of a Gibbs V-disk transmission of graphitized "Micarta," which makes it possible to change quickly from one speed to another. Changes in speed are made only when the motor and wheels are not in motion. Additional speeds can be provided.

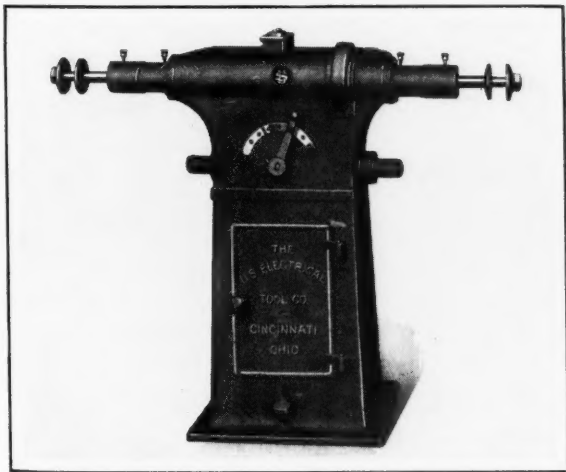
The wheel-spindle runs in four heavy-duty SKF ball bearings which are enclosed by labyrinth seals in dust-tight grease compartments. The motor runs at a speed of 3600 revolutions per minute, and is controlled by a

conveniently located push-button. This buffer is furnished in four sizes of 1, 2, 3, and 5 horsepower rating, and for alternating-current circuits of 220, 440, and 550 volts and two-or three-phase current of 25, 40, 50, and 60 cycles.

MARSCHKE HIGH-SPEED FLOOR-STAND GRINDER

Booth No. 4-B-1

Two 20-inch diameter wheels run at a surface speed of 9400 feet per minute, on a floor-stand grinder recently produced by the Marschke Mfg. Co., Grinder and Buffer Division of the Black & Decker Mfg. Co., Towson, Md. This machine was developed primarily for rough-grinding alu-



United States Electrical Tool Co.'s Four-speed Buffing and Polishing Machine



Marschke Floor-stand Grinder which Runs at a Speed of 9400 Feet per Minute



minum, brass and bronze castings.

The grinding wheels are driven by either a 5- or 7 1/2-horsepower totally enclosed, alternating- or direct-current motor. Cast-steel wheel guards supplied with hinged covers, are provided. These guards can be adjusted to keep the front top of the guard the same distance from the wheel as the work-rest. The guards can be so adjusted that any position on the wheel circumference may be used for grinding.

The spindle rotates in ball bearings mounted on each side of the motor and at the extreme ends of the spindle. Metal labyrinth seals prevent dust from

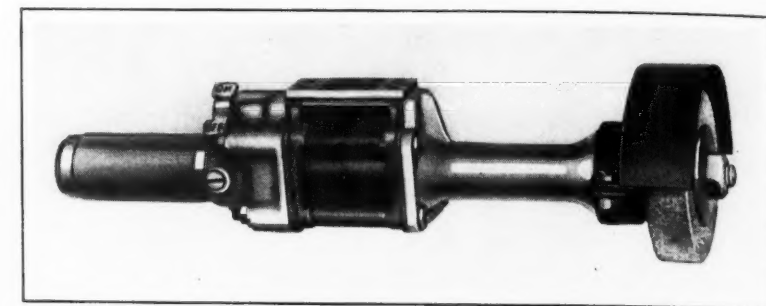


Fig. 1. Rotor Grinder Made in Two Models for Vitrified and Rubber- or Bakelite-bonded Wheels

entering the bearings and the leakage of grease. The weight of the machine in the 5-horsepower 20-inch size is 1700 pounds, an indication of the sturdy construction.

is that it may be used continuously on production work without fatiguing the operator. All models of these drills are furnished with a grip throttle and a Jacobs chuck.

ROTOR AIR GRINDER AND DRILLS

Booth No. 5-B-8

Three new air-driven tools—a grinder and two drills—have recently been developed by the Rotor Air Tool Co., 5905 Carnegie Ave., Cleveland, Ohio. Fig. 1 shows the grinder, which is designated D-O, and accommodates 4- by 1-inch grinding wheels. It is similar in construction to the larger D-1 type, and is especially handy for light grinding on a bench or in close quarters, although it is also recommended for the heavier kinds of die grinding, using 3- and 4-inch diameter wheels.

The grinder is made in two models, one having a free speed of 6000 revolutions per minute and being intended for use with

vitrified grinding wheels, and the other, called the "High Production" model, having a speed of 8000 revolutions per minute and being designed for rubber- or bakelite-bonded wheels. Both models are equipped with the Rotor governor, which controls the free speed and reduces the air consumption.

Three speeds of 1000, 1500, and 2000 revolutions per minute are available with the E-O drill illustrated in Fig. 2, which is designed for high-speed production. It is manufactured in capacities of 1/4, 5/16, and 3/8 inch, all models weighing less than 4 pounds. The particular advantage claimed for the drill

Fig. 3 shows the general appearance of E-4-C and E-40-C drills, which are made in 1/2-, 3/4-, 7/8-, and 1-inch capacities. They are designed for production drilling, reaming, tapping, stud-setting, and nut-setting. The compound gears are made of heat-treated nickel steel. Ball bearings are provided.

The quick-acting governor prevents racing of the motor while running free, which gives the spindle a uniform speed, prevents excessive wear, and reduces the air consumption. The standard rotor motor with only three moving parts, is used. There is the usual optional equipment of breast-plate, spade handle, eyebolt, etc.

Drill E-40-C has a longer cylinder than the E-4-C drill, and hence gives more power. The

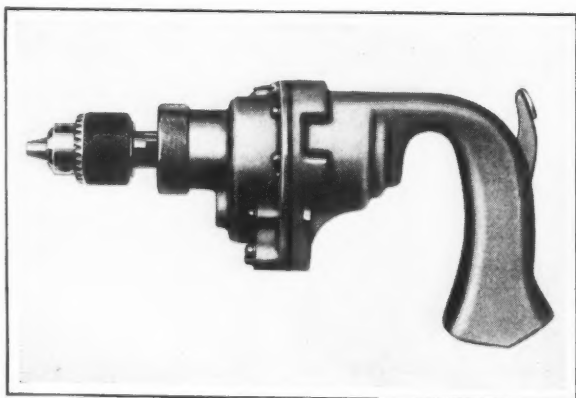


Fig. 2. Rotor Drill Manufactured in 1/4-, 5/16- and 3/8-inch Models

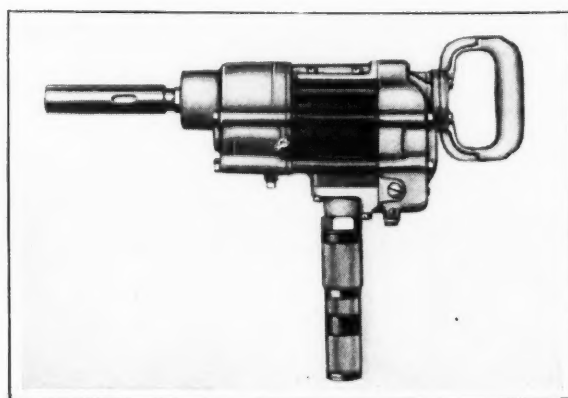


Fig. 3. Drill which may be Run at Speeds Ranging from 200 to 600 R.P.M.



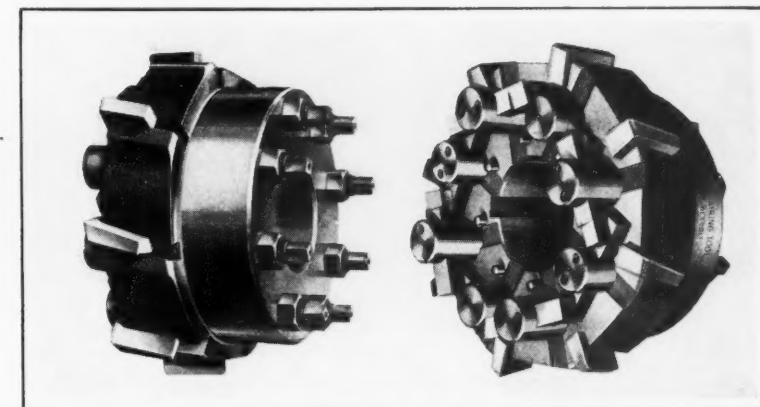
drills weigh 17 and 16 pounds, respectively. A speed range of from 200 to 600 revolutions per minute is available to suit the drilling of from 1/2- to 1-inch holes, the reaming of 3/8- to 11/16-inch holes, and the tapping of 5/8- to 3/4-inch holes.

GAIRING SWING-TOOL BORING HEADS

Booth No. 4-B-2

Tools that swing to and from the cutting position as required are furnished on boring heads recently developed by the Gairing Tool Co., 1629-37 Lafayette Blvd., Detroit, Mich., for rough- and finish-boring, facing, reaming and chamfering operations on such work as locomotive valve chambers and compressor cylinder heads. The construction of the boring heads permits the cutting of large diameters followed by the cutting of small diameters, or vice versa. The tool can also be passed entirely through the work, and cutters brought into position for machining surfaces on that end. Other tools can then be brought into position for taking finish-boring cuts on a return feed.

The operation of swinging a tool into and from its working



Gairing Boring Head with Tools that Swing to and from the Cutting Positions

position is simple, it being only necessary to loosen a nut at the rear end of the boring head, turn the cutter to the desired position by applying a wrench to the square end of the respective cutter-holding post and retighten the nut. All tools are ground in position on the head in one set-up, but any tool can be replaced and accurately set by using a micrometer. These boring heads are made in six sizes covering a range of from 6 1/2 to 18 1/8 inches. The two smaller sizes have six tool-holding posts; the three next larger sizes, eight posts; and the largest size, ten posts.

ing chaser tap; a style KJ solid adjustable die-head; and a universal chaser grinding fixture. One of the principal features of the class SJ solid adjustable tap which is shown in Fig. 3 is that all working parts, including the size adjustment, are located in the nose. The depth to which holes can be tapped is not limited by the tool itself, as the chasers project beyond the body. Chasers used in Geometric class S taps can also be used in this tool. This solid adjustable tap can be advantageously employed on chucking machines and similar equipment for sizing threads either by power or hand.

The class R receding chaser tap shown in Fig. 1 is designed for tapping taper threads where the depth is great, the taper steep, and the material tough. All working parts are fully enclosed. In an operation, the tap

GEOMETRIC TAPS AND CHASER GRINDING FIXTURE

Booth No. 1-W-21

Four recent products of the Geometric Tool Co., New Haven,

Conn., include a class SJ solid adjustable tap; a class R reced-

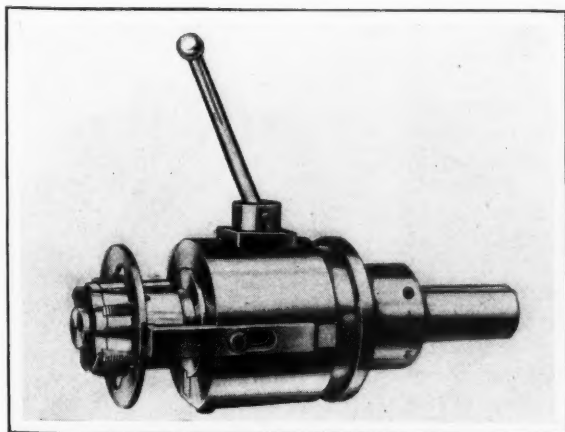


Fig. 1. Geometric Receding Chaser Tap for Cutting Taper Threads

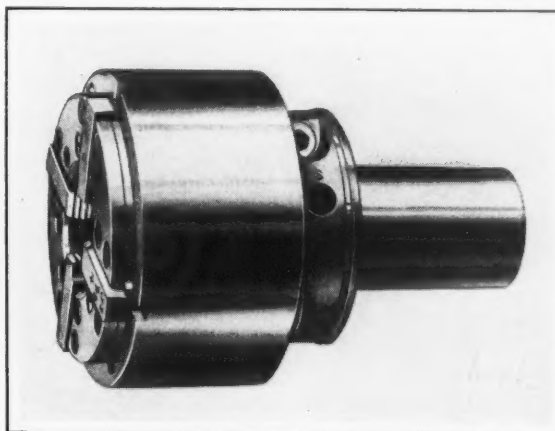


Fig. 2. Die-head which can be Adjusted without Removing from Holder



is advanced on the work as a "jam cut" tool until the chasers have taken hold. Then, as the tap advances, the chasers recede radially. At a predetermined point, they collapse and the tool is then backed out at any desired speed. This tap may be used as a stationary type with a

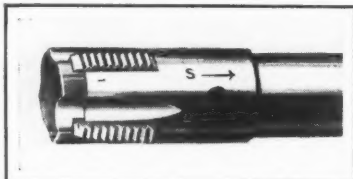


Fig. 3. Geometric Solid Adjustable Tap

plate trip in a turret lathe or as a rotary type with a plate trip on drilling machines and chucking machines. A third use is as a rotary type with a sleeve trip on automatic screw machines, threading machines, etc.

The style KJ solid adjustable die-head shown in Fig. 2, is designed for use on chucking machines and on single-purpose machines. This die-head uses the same chasers, size for size, as the Geometric style KD rotary and style KH hand-machine die-heads. It can be adjusted and securely locked without being removed from its spindle or

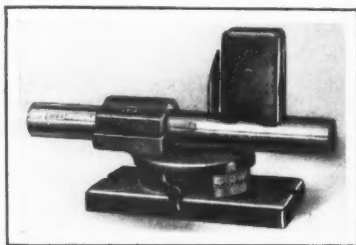


Fig. 4. Geometric Universal Chaser Grinding Fixture

holder and the chasers can be replaced without the use of tools by merely pressing down a thumb release.

The universal chaser-grinding fixture shown in Fig. 4 grinds chasers on both the cutting face and the chamfer. It can be used on any universal surface grinder or similar machine for grinding milled chasers, tapped or hobbled die-head chasers and collapsing tap chasers.

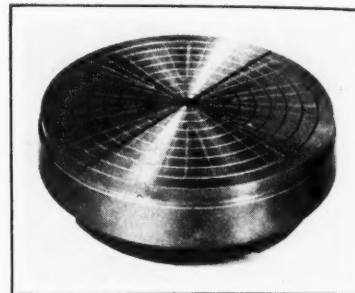
ARTER GRINDING MACHINE IMPROVEMENTS

Booth No. 1-W-8

A magnetic chuck with a top plate which can be replaced when worn has been brought out by the Arter Grinding Machine Co., 15 Sagamore Road, Worcester, Mass., for use on the rotary surface grinders built by that concern. The face design of this chuck is such that large single pieces or many small pieces can be held equally well on any portion of the surface. The diameter of the chuck is 14 1/2 inches and only one coil is employed to energize the holding surface.

Improvements on the rotary surface grinders include a brake mounted on the chuck-spindle which is operated by the same lever that controls the clutch. The main shaft, the loose pulley, and the main spindle belt idler are now equipped with ball bearings.

The wheel-slide ways of the No. 132 automatic cylindrical grinding machine have been



Arter Magnetic Chuck with Renewable Top Plate

lengthened, and the diameter of the handwheel through which compensation is made for wheel wear, has been increased. Adjustments can be made to 0.0001 inch.

"Texrope" belts are now used to drive the wheel-spindle, and the wheel-spindle bearing construction has been improved to facilitate adjustments. The wheel-dressing attachment is operated by a motor with a push-button control, having stop, start, and reverse stations. A motor-driven grinder is also provided for truing the work-centers while in position.

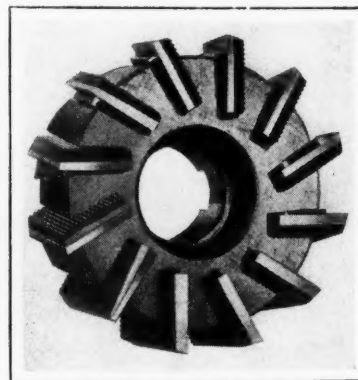
GODDARD & GODDARD INSERTED-BLADE MILLING CUTTERS

Booth No. 3-W-13

A line of inserted-blade milling cutters is being introduced to the trade by the Goddard & Goddard Co., Inc., Detroit, Mich., which includes small facing cutters, such as shell end-mills from 3 to 7 inches in diameter (applicable to the shell end-mill arbor recently standardized by milling machine manufacturers); right- and left-hand spiral facing cutters adaptable to milling machine spindle noses, in sizes from 8 to 20 inches in diameter; right- and left-hand spiral straddle mills from 4 to 20 inches in diameter; and alternate-tooth cutters from 4 to 8 inches in diameter and from 1/2 to 1 inch in width.

Only eleven sizes of blades are required for the entire line thus far developed. Machined serrations on the backs of the blades mate with corresponding serrations in the body slots. This design obviates any possibility of the blades tipping in service or

slipping radially. The serrations run longitudinally and are spaced at a pitch of 1/16 inch, so that the blades may be projected radially in multiples of the unit mentioned, as required. They may be moved outward longitudinally any desired amount. A flat wedge is used in front of each blade.

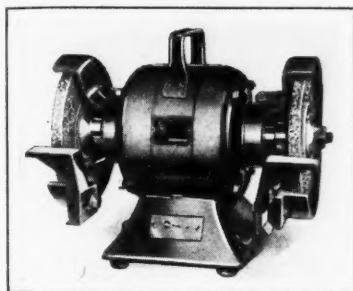


One Style of a New Series of Goddard & Goddard Cutters

**BLACK & DECKER BALL-BEARING BENCH GRINDER**

Booth No. 4-B-1

The 6-inch ball-bearing portable electric bench grinder illustrated has been brought out by the Black & Decker Mfg. Co.,



Black & Decker Bench Grinder
Equipped with Ball Bearings

Towson, Md., to meet the demand for a grinder of this type within the price range of 6- and 8-inch sizes having plain sleeve

bearings. This grinder is designed for general-purpose grinding and tool sharpening. Adjustable wheel guards permit grinding at any position on the circumference of the wheels, which are 6 inches in diameter, 1/2 inch wide and have a 1/2-inch hole.

The base is provided with rubber feet which absorb vibration and permit ordinary grinding to be done without fastening down the equipment. The motor operates on 110-volt, 50- or 60-cycle, single-phase, alternating current, maintaining a spindle speed of 3600 revolutions per minute on 60-cycle current, and 3000 revolutions per minute on 50-cycle current. The switch is located in the base. The net weight of the grinder is 36 pounds.

"DUMORE" PORTABLE GRINDER

Booth No. 5-C-4

To meet the demand for a more powerful portable grinder than previous models made by the concern, the Dumore Co., 25 Sixteenth St., Racine, Wis., has



Dumore Grinder Designed for
Production and Tool-room Work

brought out the No. 5 grinder here shown. It is designed for production grinding as well as for tool-room work. This grinder has a 1/2-horsepower universal-type motor that can be operated on either alternating or direct current at a speed of from 10,000 to 12,000 revolutions per minute. The grinder is mounted on a special toolpost which permits radial and vertical adjust-

ments, and can be used on a lathe, planer, shaper, milling machine or other machine tool.

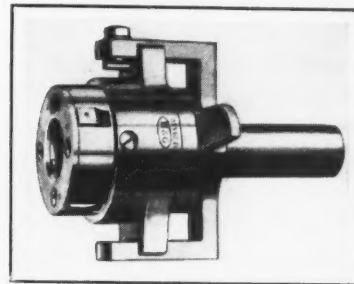
Two interchangeable quills can be supplied. One, intended for heavy external or internal grinding, has a reach of 3 1/4 inches from the inside face of the wheel to the frame of the grinder. The other is designed for deep internal grinding and has a reach of approximately 5 inches.

The grinding spindles are mounted in ball bearings provided with an automatic adjustment. Spindle speeds ranging from 4000 to 35,000 revolutions per minute are obtainable by means of interchangeable pulleys. The motor housing is constructed of aluminum, and although the rating is 1/2 horsepower, the complete motor weighs but 11 pounds 7 ounces, while the weight of the grinder, less equipment, is 28 pounds.

H & G DIE-HEAD FOR SCREW MACHINES

Booth No. 1-W-3

The 5/16-inch style D die-head shown in the illustration has re-



H & G Die-head Designed for
Small Automatics

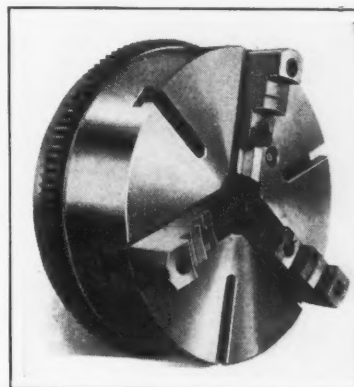
cently been added to the line of H & G die-heads to be displayed by the Eastern Machine Screw Corporation, Truman and Barclay Sts., New Haven, Conn. This die-head is designed for use on Brown & Sharpe automatic screw machines of the No. 00 size, and other small automatics.

Among the other exhibits will be a new style EE sleeve-operated die-head for rotary spindles and a new pedestal-type chaser grinder in which improved methods have been incorporated. The chaser cam-holes in the bodies of the die-heads made by this concern are now ground to give accurate support to the cams.

UNION ELECTRICALLY OPERATED CHUCKS

Booth No. 5-C-8

Chucks operated by an electric motor of from 1/3 to 1 horsepower, depending upon the chuck size and the amount of jaw pressure desired, are being introduced to the trade by the Union Mfg. Co., New Britain, Conn.



Union Chuck Operated by an
Electric Motor



There are two styles, one of which is operated internally and is intended for chucking work, while the other is operated externally and is designed for holding both chucking and bar work. These chucks can be furnished to exert a pressure on work of from 500 to 6000 pounds and the pressure is controlled at the will of the operator to suit the work. Chucks are made in 10-, 12-, 15-, 18-, and 22-inch sizes.

The internally operated chucks have a push-button control, while the externally operated chucks are

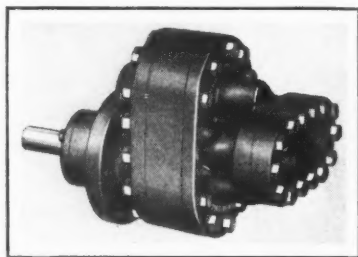
actuated by a lever. Foot controls can be provided so as to leave both hands of the operator free for chucking work.

One of the principal advantages claimed is that the holding power of the chucks is always the same, at any pressure, as it does not depend upon the physical energy of the operator, and thus work is turned out uniformly. Chucks can be furnished with either solid or reversible-top jaws, as required, or to suit any special work. All working parts are made of chrome-nickel steel and are heat-treated.

TUTHILL HIGH-PRESSURE OIL-PUMPS

Booth No. 5-C-3

A direct motor drive and a variety of mountings are features



Tuthill Model H Oil-pump for Hydraulic Power Transmission

of the model H series of high-pressure oil-pumps recently developed by the Tuthill Pump Co., 131 W. 63rd St., Chicago, Ill.,

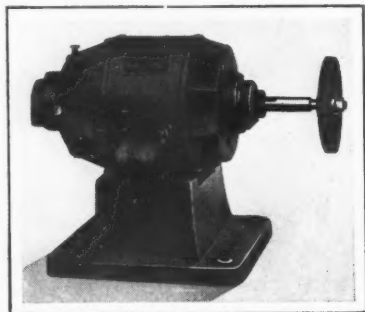
for use in the hydraulic transmission of power. These pumps are supplied in four sizes, ranging in capacity from 12 to 50 gallons per minute at pressures up to 1000 pounds per square inch. The pump shown in the illustration is attached to the machine by the circular flange. An angle-flange mounting is also available. Adapter flanges are used for exhaust and intake ports.

These pumps are designed to eliminate the possibility of trapping liquid when the gear teeth mesh. The housings and end covers are ground so that no gaskets are required. All parts are interchangeable.

BLOUNT TAP GRINDER

Booth No. 1-W-2

A machine developed primarily for grinding the flutes of taps has been brought out by the J. G. Blount Co., Everett, Mass.



Blount Grinder for Finishing Tap Flutes

The flutes are ground by using a tapered arbor on the end of the spindle which accommodates various sizes of grinding wheels. In grinding small taps, wheels of small diameter and width are used, while on larger taps, wheels up to 6 inches in diameter and from 1/2 to 3/4 inch wide are employed.

The grinder is self-contained, being driven by a Westinghouse 1 1/4-horsepower motor which is totally enclosed and is equipped with ball bearings. The motor has a speed range of from 4000 to 7000 revolutions per minute, and is controlled by a field rheostat.

O. K. MILLING, BORING AND TURNING TOOLS

Booth No. 4-B-7

A milling cutter of rugged construction, which, in a demonstration, has taken facing cuts

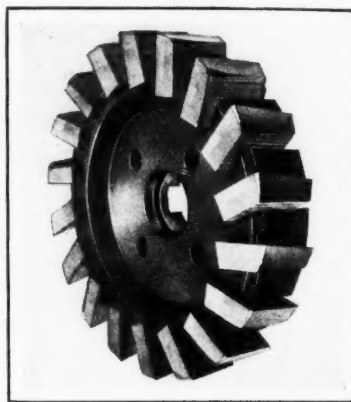


Fig. 1. O. K. Milling Cutter for Heavy Face Cuts

1/4 inch deep and 9 inches wide, at a feed of 30 inches per minute, is a recent development of the O. K. Tool Co., Inc., Shelton, Conn. This cutter, as shown in Fig. 1, has blades of the O. K. tapered serration type. The blades are of drop-forged high-speed steel, and the body is of chrome-nickel steel.

In the upper view of Fig. 2, is shown a newly developed single-

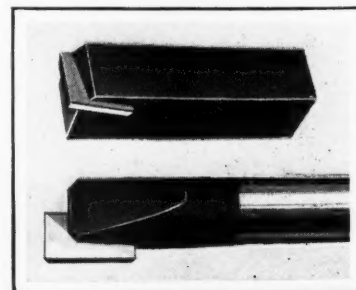


Fig. 2. Turning and Boring Tools with Renewable Blades

point tool consisting of a holder and an O. K. tapered-serrated cutter-blade. The blade requires no locking means other than the clamping screw of the tool-block, which is tightened over the blade. This arrangement gives practically the equivalent of a solid tool with the advantages of a renewable cutter. The holder is made in plain, offset, straight and



angular types. It can also be used in boring-bars, as shown in the lower view of Fig. 2.

Another development of the same company is the offset, side-

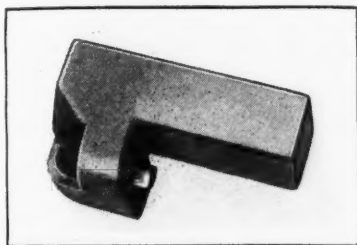


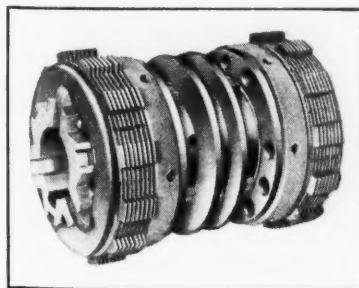
Fig. 3. Tool-holder for Close Grouping on Turret Toolposts

lock holder shown in Fig. 3. This holder is intended for use where a turret toolpost is employed for multiple tool operations. Both a right- and left-hand holder of this type are available. The offset reduces the overhang of the holder and permits close grouping of tools on adjacent sides of the turret, and in such positions that the tools on adjacent sides can be used simultaneously for facing or turning operations.

MULTIPLE-DISK MACHINE TOOL CLUTCHES

Booth No. 4-W-15

The type C.C. multiple-disk clutches recently brought out by the Twin Disc Clutch Co., Racine, Wis., primarily for use on machine tools, are designed to run in an oil spray or bath. They will be made in sizes having friction disks ranging from 3 1/2 to 6 inches of effective diameter, with the diameters varying by increments of 1/2 inch. They will also be made in 7-, 8-, 9-, 10-, and 12-inch effective-diameter sizes. In the smaller



Multiple Disk Clutch for Machine Tools

sizes, all parts are machined from bar stock except the driving plates, which are of hard rolled phosphor-bronze.

Centrifugal force acts to release the pressure levers, which are housed in the hub itself. These levers are operated by sliding wedges, which are also guided and housed within the hub. It is impossible for any part of the clutch to become detached without being deliberately disassembled.

When the clutch is installed, there are no projecting parts, and the design, as a whole, is compact, considering the high capacities developed. A modified form of this company's usual method of adjustment is applied to the smaller size clutches, while the regular construction is retained in the larger sizes. The clutch is particularly well adapted for duplex operation.

SYKES GEAR GENERATOR

Booth No. 3-W-5

A No. 1-A gear generator for cutting straight-tooth, helical-tooth, and Sykes herringbone-tooth gears up to 12 inches in diameter by 5 inches face width will be exhibited by the Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y. This machine operates on the same fundamental principle as previous Sykes machines, but there are a number of distinct improvements and changes mainly due to the fact that the machine has been designed primarily for use in the automotive field. It operates at a much higher speed than the No. 2-A machine which hitherto has been the smallest size of Sykes machine available.

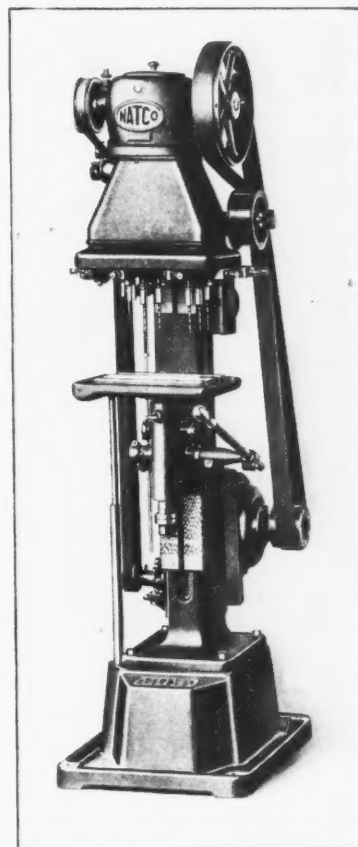
Another exhibit of this concern will be a Sykes herringbone gear of small size with a helical angle of 40 degrees. The company now manufactures gears of this angle in small sizes especially for use in the automotive and machine tool industries.

A third exhibit will be an improved Sykes gear-tooth comparator which detects errors in gear teeth to within 0.0001 inch. Previously the instrument indicated errors up to 0.001 inch.

"NATCO" DRILLING AND TAPPING MACHINE

Booth No. 1-D-1

A model C5 sensitive adjustable multiple-spindle drilling and tapping machine recently placed on the market by the National Automatic Tool Co., Richmond, Ind., may be fed either by hand or foot. The work is fed by



Natco Multiple-spindle Sensitive Drilling and Tapping Machine

moving the table vertically. Two types of heads are available, each having ten spindles. One head is intended for drilling only, and the other for drilling and tapping. A T-slot is machined in the flange of the head to permit attaching the spindle and arm equipment.

The machine is furnished for either a belt or motor drive. A coolant system having a pump located on one side of the column near the bottom of the machine, and driven by a belt from a pulley on the main drive shaft, may be furnished. The reservoir for the coolant is in the base.



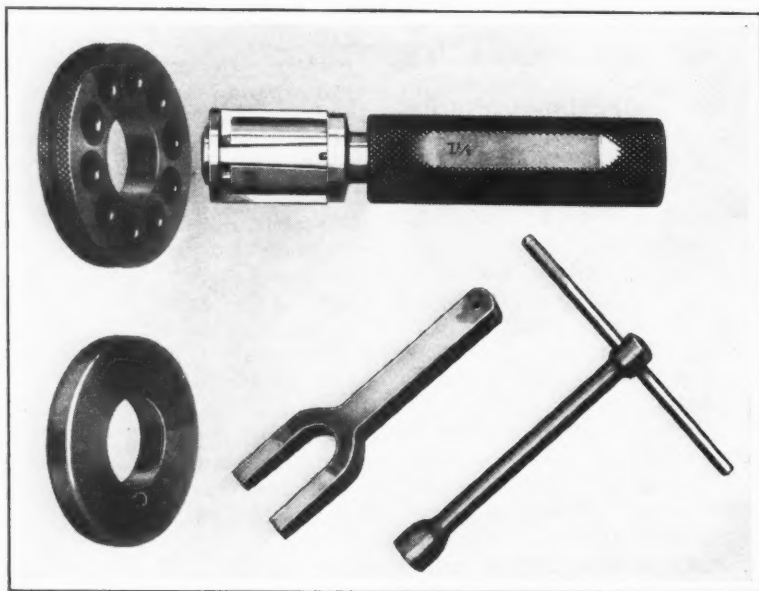
The maximum distance between the top of the table and the bottom of the spindle frame is 16 7/8 inches, and the minimum distance between the centers of the spindles ranges from 7/16 to 13/16 inch, depending on the size of drills used. Spindle speeds from 600 to 2400 revolutions per minute are available. The drilling capacity in cast iron is ten 1/4-inch drills, and in steel, ten 3/16-inch drills.

BATH ADJUSTABLE PLAIN PLUG GAGE

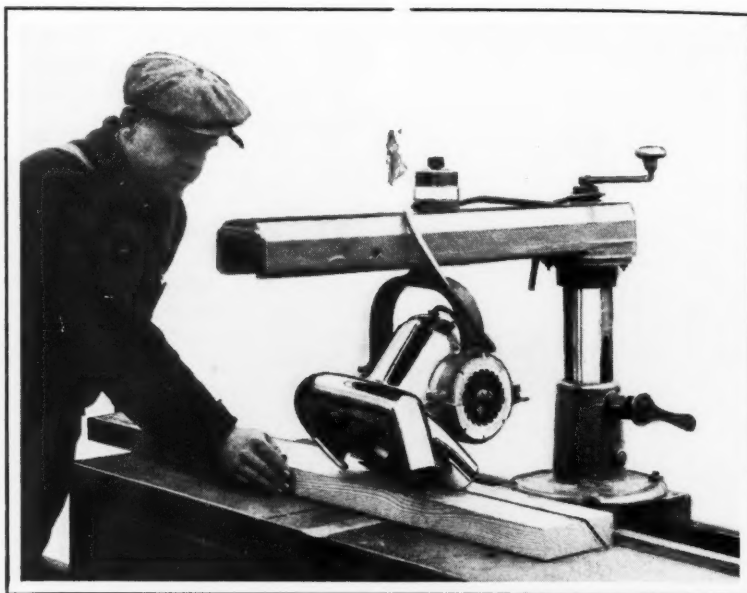
Booth No. 5-W-1

A plain plug gage with four adjustable jaws which provide means of compensating for wear is a new product of John Bath & Co., Inc., 8 Grafton St., Worcester, Mass. This device is based on the principle of the Bath internal micrometer, and is designed to give longer life to the tool. The jaws are adjusted by means of a special wrench which is used to turn a screw in the gage handle. The gage is applicable wherever plain plug gages are suitable for checking the sizes of holes.

A master ring is furnished as a reference standard for maintaining the gage at the proper size. Its accuracy is said to be within ± 0.00005 inch.



Bath Adjustable Plain Plug Gage and Accessories



De Walt Woodworking Machine on which Twenty-nine Operations can be Performed

DE WALT "JUNIOR" WOODWORKING MACHINE

Booth No. 6-B-5

Twenty-nine distinct cutting operations on lumber, including dadoing, routing, mitering, rabbeting, grooving, mortising, and tenoning, may be performed with the "Junior" woodworking machine made by the De Walt Products Corporation, Leola, Pa. This equipment embodies the various features of the "Wonder Worker" built by the same con-

cern. It is driven by a universal motor which operates on either alternating or direct current taken from any lighting socket. The machine is provided with dials for adjusting it accurately to any position, and is equipped with a ripping gage. Another feature is that the operator can change from cross cutting to ripping without stopping the motor. Included in the standard equipment supplied with this machine is an adjustable guard for the saw, which effectively protects the operator.

With the 12-inch combination cross-cut and rip saw that is standard equipment, the machine rips 2-inch stock at the rate of 20 lineal feet per minute. Fitted to a wooden table measuring 29 by 59 inches, the outfit complete weighs approximately 235 pounds and can be easily carried by two men.

The model D "Wonder Worker" has recently been designed along more powerful lines. It is driven by a five-horsepower motor, and rips 4-inch fir at the rate of 50 lineal feet per minute and cross-cuts 6-inch material. This machine is also portable, weighing 340 pounds fitted to a 29- by 59-inch table.

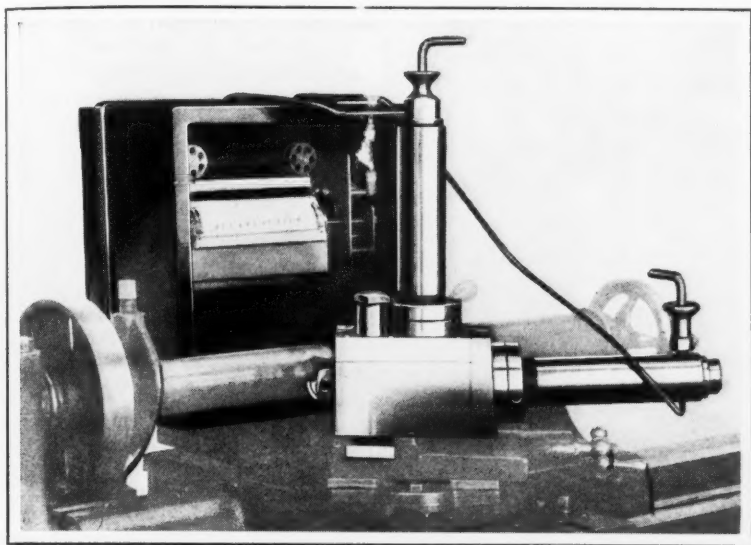


Fig. 1. Hall "Machinabilimeter" Devised for Determining the Pressure on Tools in Cutting Metals

HALL "MACHINABILIMETER"

Booth No. 2-W-11

A device known as the "Machinabilimeter" has been developed by the Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia, Pa., for determining the pressure on the tool when cutting metals. From the readings obtained, the horsepower required to cut various metals can be determined. The device facilitates a study of tool cutting edges and of the most suitable cutting oils for different metals. It can be used on lathes, milling machines, planers, grinding machines, etc., but its simplest application is on the engine lathe.

For convenience, a circular cutting tool is used as shown at A, Fig. 2. This tool is mounted on the end of lever B which is pivoted to the main body of the device, the opposite end of the lever carrying a roller that contacts with piston C of cylinder D. The upper part of this cylinder is filled with oil through the priming cup at the top. Pressure exerted downward on the circular form cutter by the metal being machined, is transmitted through lever B and piston C to the oil in the cylinder, and then to either a dial gage or a continuous recording instrument, such as shown in Fig. 1.

For recording back pressure

or forward pull on the cutting tool, lever B is also attached to the horizontal plunger E, which is carried in a second cylinder F. This cylinder is also filled with oil through a priming cup. Pressure placed on the oil in cylinder F is registered on a dial gage or on a double-recording instrument, such as shown in Fig. 1.

A micrometer dial indicator may be attached to lever B to bear against the work and show whether or not the tool is pulled toward the work or pushed away from it, or whether it remains neutral. The gage also shows this, but the micrometer indicator in addition gives the thickness of the chip and shows whether it remains constant.

CINCINNATI GEARED-HEAD LATHES

Booth No. 2-W-18

Sixteen- and twenty-four-inch geared-head lathes which may be equipped with standard attachments or special fixtures to adapt them either for tool-room use or production work have recently been designed by the Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati, Ohio. On these machines all spindle speeds are obtainable by shifting one lever. An apron control is supplied to start and stop the lathes. A plunger is provided for locking the spindle when removing chucks and faceplates, thus preserving the accuracy of the head.

Both lathes are motor-driven. On the 16-inch size the motor is

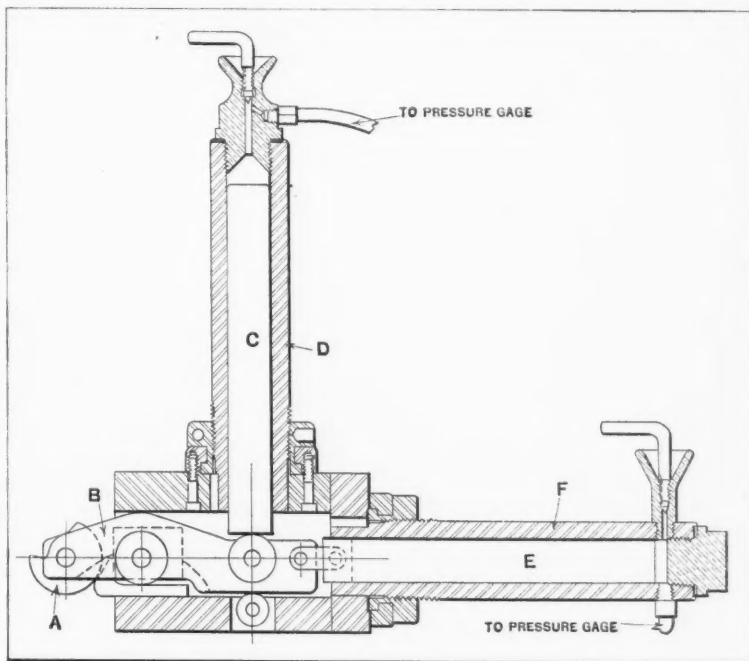


Fig. 2. Sectional View of the "Machinabilimeter"



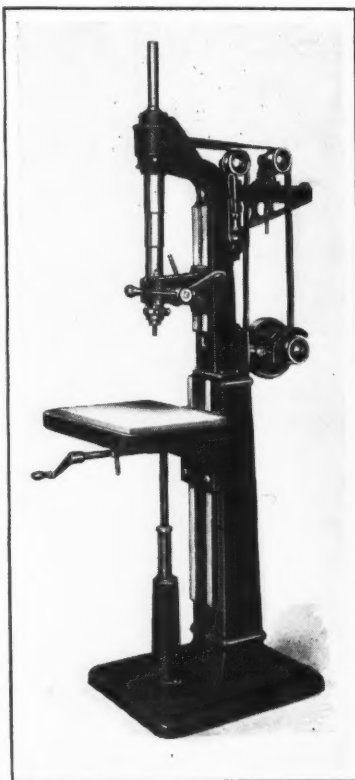
mounted inside the leg under the head, while on the 24-inch lathe it is mounted on the rear of the cabinet leg. Both machines are self-contained units that may be moved, as a whole, with the electrical equipment, to any part of the shop where they may be required.

BUFFALO SLIDING-HEAD DRILLING MACHINES

Booth No. 1-A-4

The 14-inch pedestal-type sliding-head drilling machine illustrated has recently been brought out by the Buffalo Forge Co., 144 Broadway, Buffalo, N. Y. This machine is also made in a bench type. These machines are ball-bearing equipped and designed for a maximum spindle speed of 10,000 revolutions per minute.

The principal dimensions are: Distance from column to center of spindle, 7 1/8 inches; travel of spindle, 3 1/2 inches; vertical adjustment of the head, 7 1/4 inches; and maximum distance from chuck to table, 11 inches. The machines have a capacity for handling drills up to 7/16 inch in diameter. The pedestal-type machine weighs 500 pounds, and the bench type, 260 pounds. About 1/2 horsepower is required for the drive.



Buffalo Sliding-head Drilling Machine with Spindle Speeds up to 10,000 Revolutions per Minute

LINK-BELT ROLLER CHAIN

Booth No. 4-C-1

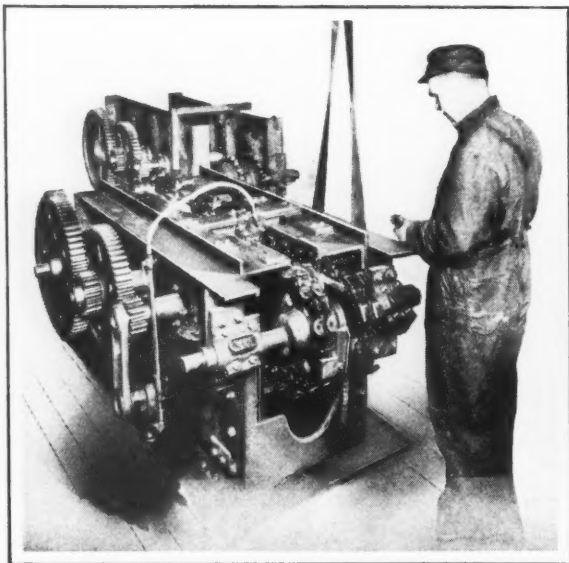
A roller chain developed by the Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill., is shown in the illustration applied to a semi-

automatic broaching machine. Two endless matched strands of the chain, running side by side, carry the broaches. The broaches are hooked to attachments secured to the two chains at regular intervals. On the under side of each attachment is a half-nut which is engaged by a power-driven screw. This screw is located just beyond the movable faceplate which holds the work stationary while the chains draw the broach through. Two of the half-nuts are constantly in engagement with the screw, which serves to drive the endless chains continuously in one direction.

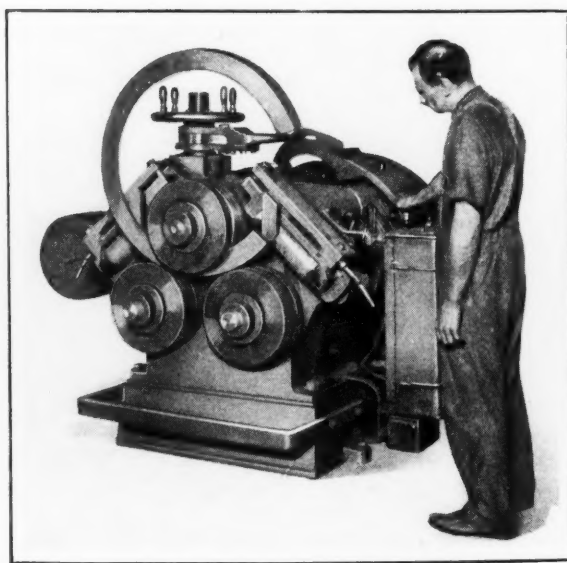
ATTACHMENT FOR BUFFALO BENDING ROLLS

Booth No. 1-A-4

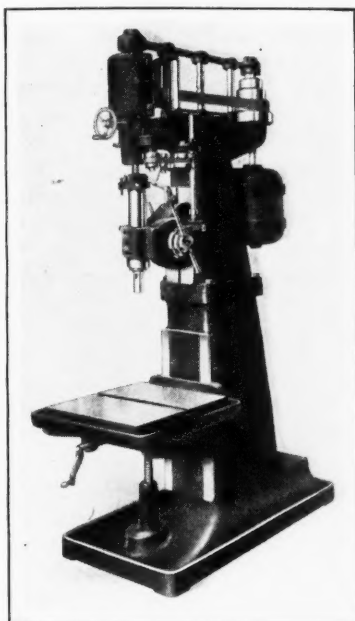
The No. 2 horizontal bending roll built by the Buffalo Forge Co., 144 Broadway, Buffalo, N. Y., is shown in the illustration equipped with a recently developed attachment. With this attachment angle-iron rings are bent with the leg inward as readily as with the leg extending outward. The attachment also serves as a gage, and is useful in opening up rings that have been bent to too small a diameter. The attachment can be applied to Buffalo bending machines now in use.



Link-Belt Roller Chain Applied to Broaching Machine



Buffalo Angle-iron Ring Bending Attachment



Henry & Wright "Hi-Power"
Sensitive Drilling Machine

HENRY & WRIGHT SENSITIVE DRILLING MACHINE

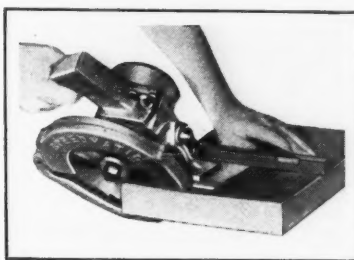
Booth No. 2-W-4

A "Hi-Power" sensitive drilling machine which has a capacity for driving a 7/8-inch drill at its maximum operating speed and feed, and is intended to anticipate the use of tungsten-carbide drills, has recently been brought out by the Henry & Wright Mfg. Co., Hartford, Conn. The machine is made in both single- and multiple-spindle types: in the latter case, the spindles are spaced 12 inches between centers. Each spindle is mounted in ball bearings and has six driving splines at its upper end. It is regularly furnished with a No. 2 Morse taper, but a No. 3 Morse taper can be provided.

The cap on the upper end of the spindle sleeve contains an oil reservoir having sufficient capacity for ten hours of continuous operation. A sight glass shows the amount of oil in this reservoir at all times. The machine may be provided with a belt drive, belted motor drive, or individual-spindle motor drive. Four spindle speeds, ranging from 620 to 1800 revolutions per minute, are regularly available,

and with a back-gear attachment, four additional speeds ranging from 150 to 450 revolutions per minute may be obtained. The spindle has a travel of 7 inches when operated either by hand, semi-automatically or with a full automatic feed.

A simple control device makes it possible for the operator to engage or disengage the back-gears while the machine is in operation. The power feed attachment ordinarily furnishes feeds of 0.004, 0.008, and 0.012 inch per revolution, but feeds as high as 0.036 inch per revolution can be provided for reaming operations. The base of the machine contains a reservoir for the coolant.



"Speedmatic" Saw which Runs at
10,000 Revolutions per Minute

PORTER-CABLE PORTABLE ELECTRIC SAW

Booth No. 1-W-19

The saw blade is mounted directly on the motor armature in the type K-8 "Speedmatic" electric saw recently placed on the market by the Porter-Cable Machine Co., Syracuse, N. Y. The armature runs in two ball bearings. The universal type motor of this saw is rated at 1/2 horsepower and drives the saw at 10,000 revolutions per minute. It is controlled by a switch operated by the index finger. The switch automatically shuts off the power if the pistol grip handle is released.

The guard has sufficient capacity to accommodate blades up to 8 inches in diameter, with a maximum vertical depth of cut of 2 1/4 inches. The saw can be set at any angle up to 45 degrees,

and at the maximum angle, cuts to a depth of 2 3/4 inches. Blades for a variety of purposes can be furnished. The hinged guard is held in position by a small coil spring, thus insuring constant protection. The fan for cooling the motor also serves to keep the work clear of sawdust. The saw weighs 12 pounds, and can be easily operated by one hand while the other hand holds the work.

GLEASON CUTTER-ANGLE TESTING DEVICE

Booth No. 1-B-4

A testing device has been brought out by the Gleason Works, 1000 University Ave., Rochester, N. Y., for use as a comparator to insure that the blades of circular cutters used in Gleason spiral-bevel and hypoid gear-cutting machines are so mounted as to have identical cutting-pressure angles. These blades are now sold separately from the cutter-heads, and it is essential that they be carefully checked after assembly in the heads. Any corrective work required to locate the blades ac-



Gleason Device for Testing Angle
of Cutter Blades



curately can be done on the new fixture without removing the cutter.

The device includes an indicator which reads to 0.0001 inch, a carrier against which the cutter is held by spring pressure, and a dovetail slide on which the carrier is adjustable angularly. By moving this slide on the base, the cutter blades can be slid back and forth under the indicator finger to check their positions, the cutter-head being indexed to bring the successive blades to the finger.

The indicator holder is vertically and horizontally adjustable so that it can be used for checking both inside and outside blades. The device is built in two sizes, one for 9-inch cutters and the other for 12-inch cutters.

H & G THREADING MACHINE AND CHASER GRINDER

Booth No. 1-W-3

Two H & G single-spindle threading machines mounted on one pedestal to give a duplex outfit are shown in Fig. 1. This equipment is built by the Eastern Machine Screw Corporation,

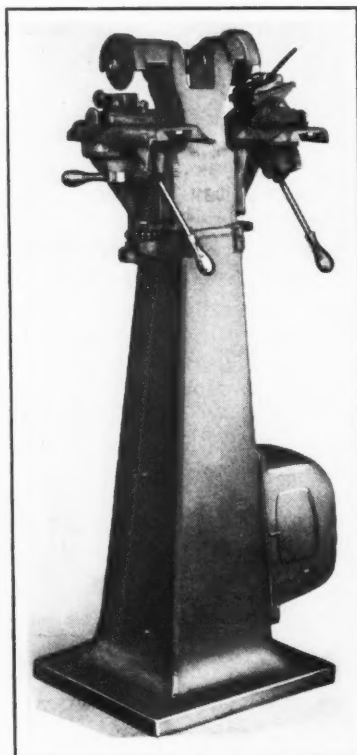


Fig. 2. H & G Chaser Grinder with Enclosed Motor Drive

Truman and Barclay Sts., New Haven, Conn. Even more machines can be mounted together. The spindle and collet type of

slide used on these threading machines is adaptable to a wide range of threading on small machinery and automotive parts. Changes from one kind of work to another are made by means of interchangeable collets or spindle-nose pieces. An open-side jaw type of slide can be fitted for handling long rods.

Changing from right- to left-hand threads, or vice versa, is accomplished by simply changing the chasers and reversing the belt and pump gear lever. The production capacity per unit is 300 to 1000 pieces per hour.

Another machine recently developed by this company, which will also be exhibited, is the chaser grinder shown in Fig. 2. This machine is driven by a motor enclosed in the pedestal.

SLEEPER & HARTLEY SPRING-COILING MACHINE

Booth No. 5-A-1

The spring-coiling machine shown in the accompanying illustration is the latest design of its type built by Sleeper & Hartley, Inc., Worcester, Mass. In this machine, the wire is gripped between rolls which feed it forward

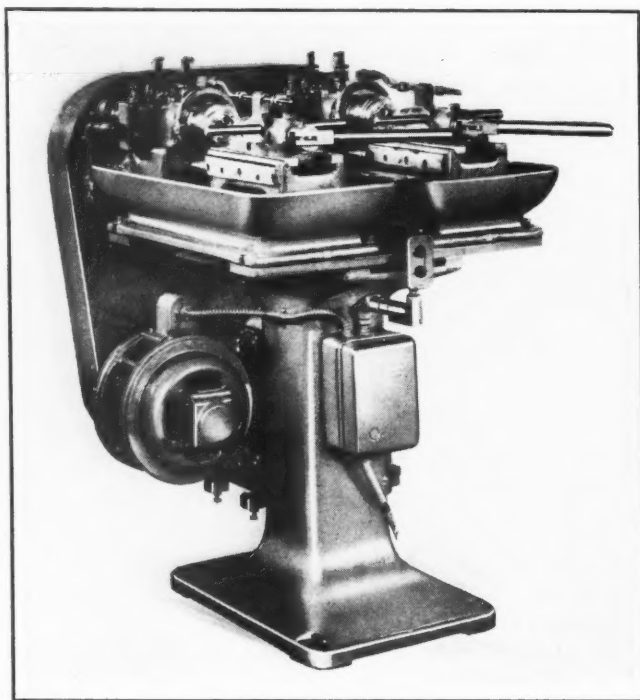
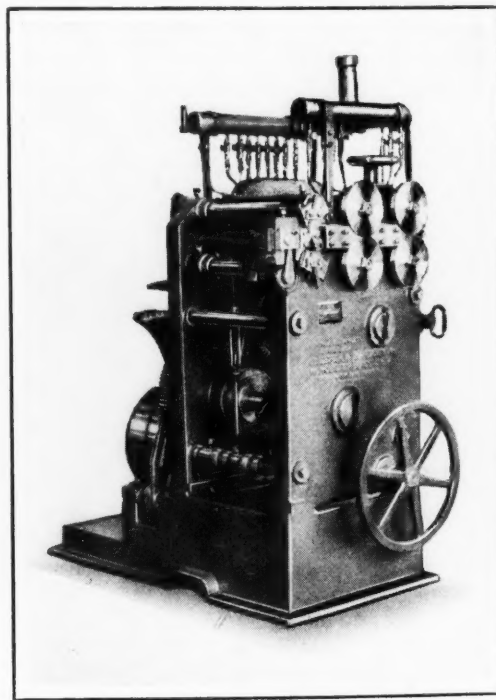


Fig. 1. Eastern Machine Screw Corporation's Two-spindle Threading Machine



Sleeper & Hartley Machine for Coiling Springs of Various Forms



against coiling tools that form it into springs of the desired shape by a deflecting action. A predetermined length of wire is used for each spring, but this length can be varied if desired.

Each spring is cut off automatically as soon as it is produced. Either right- or left-hand springs with open or closed coils can be wound. The machine will also produce springs having different diameters at different portions of their length or it may be set up to make cone-shaped springs with any degree of taper or with a variable pitch. In fact, springs of almost any contour, with tapered ends, or with coils closed at either or both ends, can be produced.

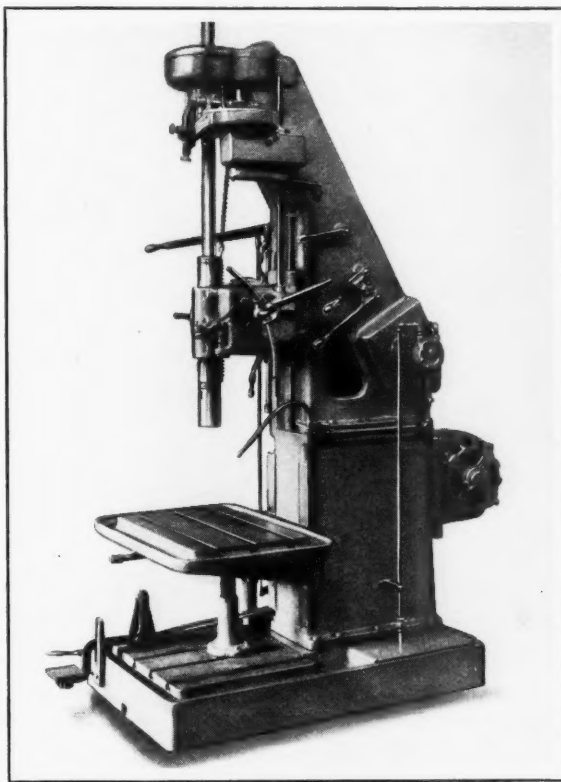
The adjustments required in changing from one form of spring to another can be made in from ten seconds to twenty minutes, depending on the kind of spring. Springs can be made from either round or square wire. The ordinary type of spring made from 1/8 inch wire can be produced at a speed of about 50 per minute. The machine is made in eleven sizes of various capacities for handling oil-tempered wire from 0.004 to 5/8 inch in diameter.

BARNES DRILL CO.'S DRILLING AND TAPPING MACHINE

Booth No. 2-D-4

A sliding-head, self-oiling, all-gear driven tapping machine, provided throughout with anti-friction bearings, has been brought out by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill. This machine, known as the No. 262, is provided with a silent chain drive, but may also be furnished with a single-pulley drive. The spindle is 2 inches in diameter, of six-spline construction, and provided with a heavy roller thrust bearing. The spindle sleeve is fitted with the com-

pany's patented dovetail construction rack. The split bearing for the spindle sleeve is also a new feature, and makes it easy to take up all wear during the course of years. The regular spindle travel at any setting of the head is 15 1/2 inches, but any other length may be provided. The regular travel of the sliding head is 19 1/2 inches.



Self-oiling Drilling and Tapping Machine Built by the Barnes Drill Co.

Levers are provided for quickly raising and lowering the sliding head and clamping it in position.

There are eight quick-change geared speeds with lever controls in the front. There are also eight spur-gear feeds with similar lever controls. The speeds and feeds are clearly indicated for each setting of the respective levers. All bearings are automatically oiled.

The machine is designed to take high-speed steel twist drills up to 2 1/2 inches in diameter. It will bore holes up to 8 inches in diameter in cast iron, and is suitable for cylinder boring, deep-hole and heavy drilling, as well as for tool-room service.

OESTERLEIN MACHINE CO.'S "MIL-O-MATIC"

Booth No. 1-A-13

An automatically operated, hydraulically fed bed-type milling machine known as the "Mil-O-Matic" will be exhibited by the Oesterlein Machine Co., Cincinnati, Ohio. This machine may be equipped with either a plain reciprocating table having a working surface of 21 by 48 inches, affording 36 inches of feed, or with an automatic indexing table having a 14- by 24-inch working surface, which is mounted on a slide having 24 inches of feed. The indexing table makes a half-turn at the end of its return stroke, and then advances to the cut. The machine is available as a single-, duplex-, multiple- or vertical-spindle machine, with several standard bed and table lengths. Special heads may be applied to meet requirements.

The spindle head is a self-contained unit that carries its own motor; the starting, stopping, and reversing mechanism and control lever; pick-off gears for obtaining different speeds; and all adjustable controls. Being self-contained, the

spindle head can be mounted in any position.

In the base of the column on which the spindle head is mounted is a compartment where a direct-connected motor-driven "Oilgear" unit is located for furnishing the table feed. A cam plate operates the lever that controls the pumping mechanism and governs the rate and direction of table motion. Either a constant, variable, or intermittent feed is available, depending upon the contour of the cam.

The normal range of spindle speeds available on this machine is from 20 to 242 revolutions per minute, while the feeds range from 0 to 30 inches per minute.



Index of New Shop Equipment at the Exposition

	Page		Page
Abrasive Surface Grinder.....	114	Ingersoll Milling and Boring Machine.....	91
American Radial Drilling Machines.....	117	Ingersoll Rail-Milling Machine.....	96
American Shaper.....	96	Kane & Roach Roll Straighteners.....	108
Arter Grinding Machine.....	120-B	Kearney & Trecker Milling Machine.....	113
Barnes Drill Co.'s Drilling and Tapping Machine.....	120-K	Landis Automatic Threading Machine.....	110
Bath Adjustable Plain Plug Gage.....	120-F	Landis Grinding Machines.....	99
Black & Decker Bench Grinder.....	120-C	Libby-International Turret Lathe.....	106
Blount Tap Grinder.....	120-D	Link-Belt Roller Chain.....	120-H
Bryant Automatic Hole-Grinders.....	95	Lodge & Shipley Engine Lathe.....	105
Buffalo Bending Rolls.....	120-H	"Lo-swing" Piston-turning Automatic.....	89
Buffalo Sliding-head Drilling Machines.....	120-H	Lucas Boring, Drilling and Milling Machine.....	90
Cincinnati-Bickford Radial Drill.....	114	Marschke Floor-stand Grinder.....	119
Cincinnati Gear Burnisher.....	87	Monarch Automatic Lathe.....	108
Cincinnati Lathe & Tool Co.'s Lathes.....	120-G	National Automatic Tool Co.'s Drilling and Tapping Machine.....	120-E
Cincinnati Shapers.....	101	Norton Grinding and Lapping Machines.....	86
Cochrane-Bly Metal-sawing Machine.....	109	Oesterlein "Mil-O-Matic" Milling Machine.....	120-K
De Walt Woodworking Machine.....	120-F	Ohio "Super-Dreadnaught" Shaper.....	115
Diamond Grinding Machines.....	97	O. K. Milling, Boring and Turning Tools.....	120-D
"Dumore" Portable Grinder.....	120-C	Oliver Die-making Machine.....	116
Eastern Machine Screw Corp'n's Die-head.....	120-C	Oliver Face-mill, Drill and Tap Grinders.....	102
Eastern Machine Screw Corporation's Threading Machine and Chaser Grinder.....	120-J	Porter-Cable Lathe.....	101
Farrel-Birmingham Co.'s Gear Generator.....	120-E	Porter-Cable Portable Electric Saw.....	120-I
Foote-Burt Broaching Machine.....	93	Pratt & Whitney Deep Hole Driller.....	107
Foote-Burt Drilling Machines.....	94	Pratt & Whitney Jig Boring Machine.....	112
Fosdick Radial Drilling Machine.....	105	Putnam Continuous Milling Machine.....	95
Gairing Boring Heads.....	120-A	Putnam Gang Slitting Machines.....	100
Gardner Disk Grinding Machines.....	90	Reed-Prentice Jig Borer and Miller.....	103
General Electric Planer Control.....	116	Rotor Air Grinder and Drills.....	120
Geometric Taps and Grinding Fixture.....	120-A	Ryerson Flue-making, Sawing, Shearing and Punching Equipment.....	92
Gleason Cutter-angle Testing Device.....	120-I	"Sabeco" Bearing Metal.....	113
Gleason Spiral-bevel Gear Generator.....	88	Sellers Hob and Cutter Grinder.....	106
Goddard & Goddard Milling Cutters.....	120-B	Sidney Engine Lathes.....	104
Goss & De Leeuw Chucking Machine.....	85	Sleeper & Hartley Spring-coiling Machine.....	120-J
Gould & Eberhardt Gear-Hobbing Machines.....	98	Springfield High-speed Lathe.....	115
Gould & Eberhardt Shaper.....	109	Tuthill High-pressure Oil-pumps.....	120-D
Hall "Machinabilimeter".....	120-G	Twin Disk Clutch Co.'s Clutches.....	120-E
Hannifin Air-operated Equipment.....	117	Union Electrically-operated Chucks.....	120-C
Henry & Wright Drilling Machine.....	120-I	United States Multi-speed Buffer.....	119
Hill-Curtis Grinding Machines.....	118	Van Norman Oscillating Grinding Machine.....	111
Hydraulic Press Mfg. Co.'s Press.....	112	Walker Surface Grinder.....	111

Program of the National Machine Tool Congress

Monday, September 30, 8:00 P. M.

Sponsored by the Machine Shop Practice Division of the American Society of Mechanical Engineers.

"What Information Does the Machine Tool Buyer Need from the Machine Tool Salesman?" by George T. Trundle, Jr., President, Trundle Engineering Co., Cleveland, Ohio.

Tuesday, October 1, 8:00 P. M.

Sponsored by the Machine Shop Practice Division of the A. S. M. E.

"Present Status of Cemented Tungsten-carbide Tools and Dies," by Dr. Zay Jeffries, General Electric Co., Schenectady, N. Y.

Wednesday, October 2, 8:00 P. M.

Sponsored by the Production Division of the Society of Automotive Engineers.

"Economic Production Quantities," by Professor F. E. Raymond.

Thursday, October 3, 8:00 P. M.

Sponsored by the Production Division of the Society of Automotive Engineers.

Round Table Discussion of Subjects of Importance to the Automotive Industry.

Friday, October 4, 6:30 P. M.

Joint Dinner of the Machine Tool Congress, and the participating societies.

All sessions to be held at the Hotel Cleveland

New Machine Cuts Time from Weeks to Days

Pump Casings Formerly Requiring from Three to Four Weeks for Machining and Assembling are Now Turned out in Three Days

FOUR distinct kinds of operations—milling, boring, facing, and grinding—are performed in one set-up of the work on a special planer-type machine recently built by William Sellers & Co., Inc., 1600 Hamilton St., Philadelphia, Pa. This machine was designed primarily for handling centrifugal pump casings of 6, 7 or 8 stages. Twenty-eight parts formerly made up the casings and these

adapt the machine for handling a general run of work when not being used for centrifugal pump casings. The pump casings are machined in pairs consisting of the upper and lower halves, which are held in separate fixtures with the joint surfaces uppermost.

The first operation consists of milling the joint surfaces, which is done with a 12- or 16-inch mill-

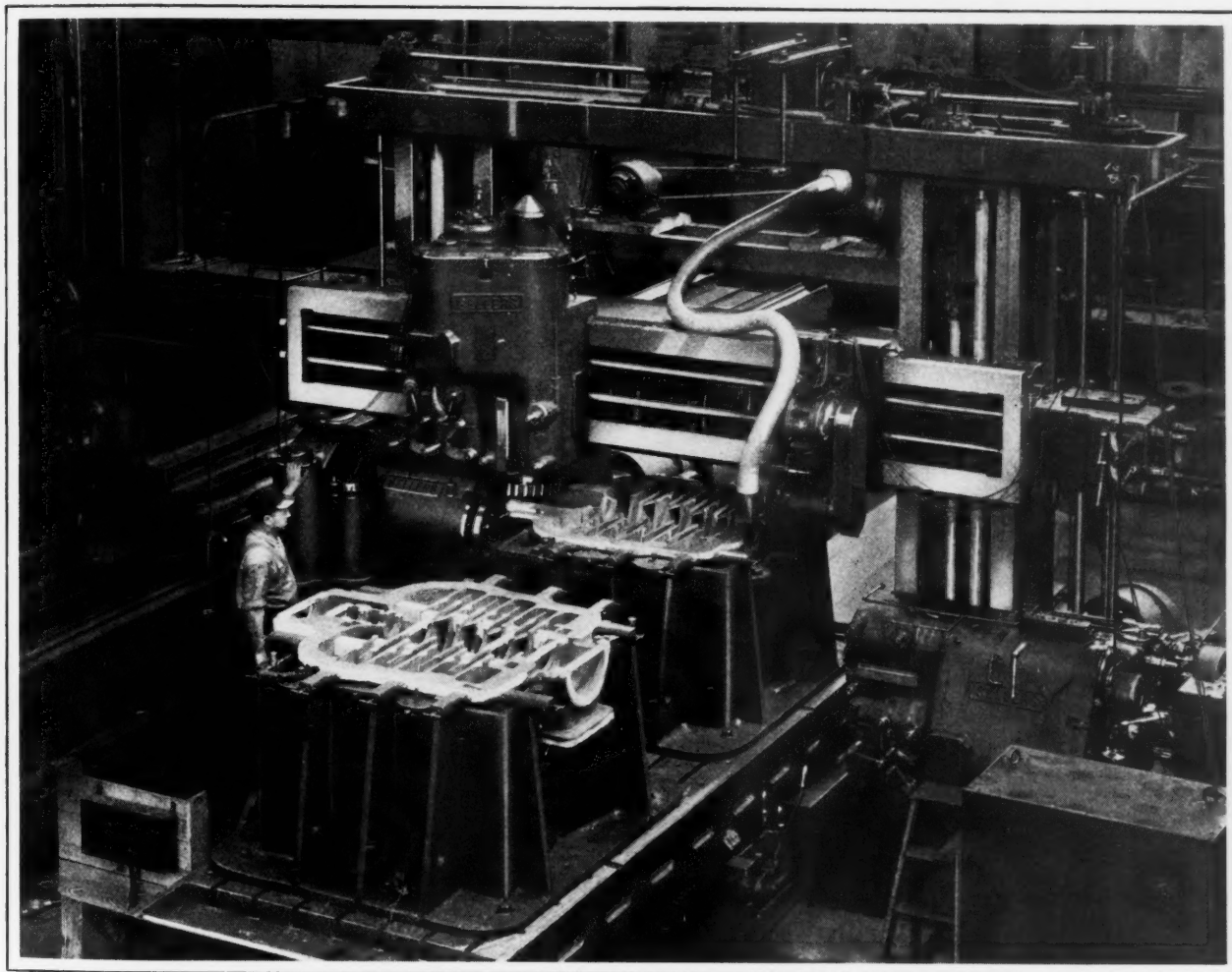


Fig. 1. Planer-type Machine which has Enabled Pump Casings to be Simplified from Twenty-eight to Two Parts

necessitated forty-four separate machine operations. Machining and assembling them required from three to four weeks. The special machine has permitted the casings to be simplified to two parts only and these, except for a final reaming operation, are now completely machined and assembled in less than three 8-hour days.

As may be seen from Figs. 1 and 3, the machine is equipped with a rail milling head, a right-hand side milling head, a grinding head on the rail and a boring head which is carried on an extended apron that is integral with the left-hand end of the rail. The two milling heads are standard units and

ing cutter mounted on the rail head as shown in Fig. 1, one roughing and one finishing cut being taken. In preparing for the next operation, which consists of boring and facing the different stages, the milling cutter is removed and the rail head is traversed to the left and coupled to the boring head. A special Davis bar is then bolted to the boring head faceplate and supported by outboard bearings fastened to the cross-rail, as illustrated in Fig. 3. This bar is made with a series of integral disks corresponding to the number of stages in the pump. The disks and the bar proper contain cutters for boring and facing the stages to the proper diam-

eters and thicknesses, as well as for machining end and intermediate bearings for the rotor shaft. Eighty-six cutters in all are used.

When this tool-bar is in place, the table is traversed to a fixed stop opposite one of the fixtures and locked in position. Then, with the boring-bar driven at the proper speed through the rail milling head, the cross-head is fed downward slowly to feed the cutters into the casing as required. The cross-rail is then raised to lift the boring-bar and the table is unlocked and traversed to bring the other casing into position, after which this casing is machined in the same manner as the first.

This first boring operation is confined to machining surfaces relatively small in diameter, and is followed by another that is just the same, with the exception that a larger-diameter boring-bar is employed, and a slower speed is used.

Upon the completion of the boring and facing operations on both halves of the casing, the fixture

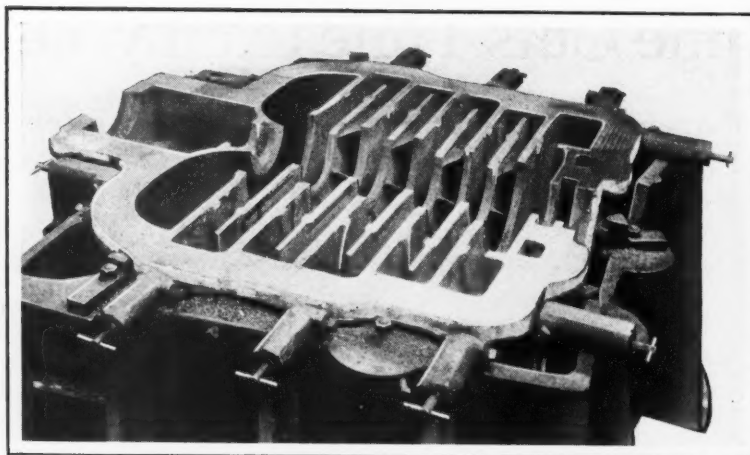


Fig. 2. Typical Pump Casing as Viewed from the Top

clamps are loosened to relieve the castings of strain. Then the second boring-bar is removed and the grinding head brought into the operating position. By traversing the rail and adjusting the grinding head slide, the wheel is set so as to grind off just enough metal to compensate for any spring in the casings.

The table is then set in motion and its length of travel and reversal controlled as in operating a planer until the operation is completed. Unlike a planer, however, the table speed is the same in both directions. The grinding head is fed by a screw across the rail. At the end of the grinding, the casings are removed from their fixtures and bolted together.

Each milling head has an individual motor drive which allows the use of different speeds. This feature is advantageous where cutters of different diameters are required on the same job. The boring head has a range of speeds from 1 to 20 revolutions per minute.

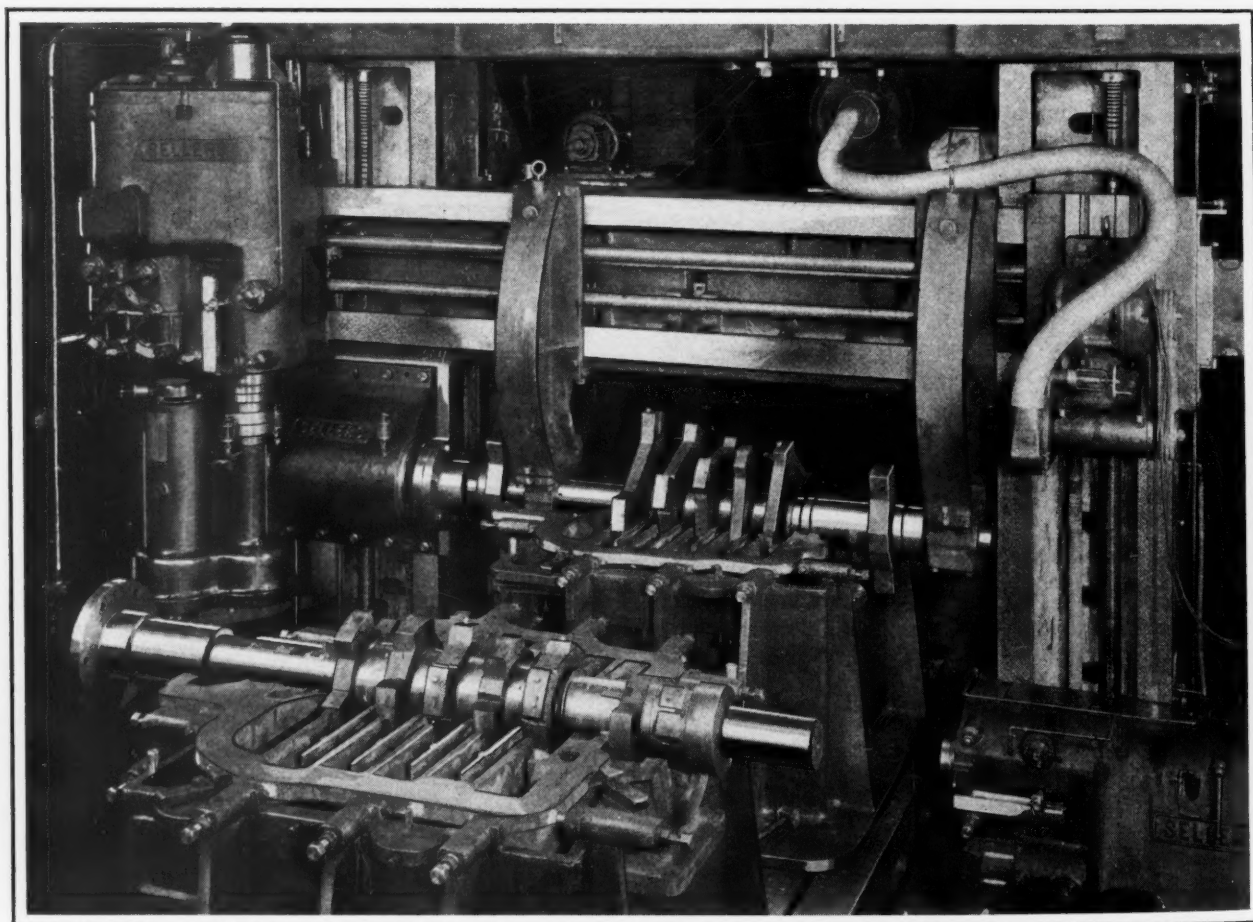


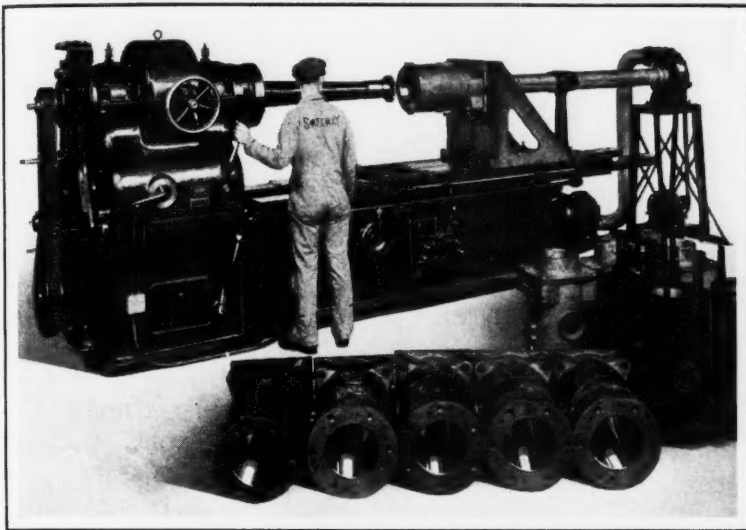
Fig. 3. Machine Set Up for a Boring and Facing Operation

New Machinery and Shop Equipment

A Monthly Record of New Metal-working Machinery, Tools, and Devices
for Increasing Manufacturing Efficiency and Reducing Costs

MICRO LARGE INTERNAL GRINDING MACHINE

Bores ranging from 4 to 24 inches in diameter or larger and up to 48 inches in depth or deeper may be ground in the model JG machine recently



Finishing Diesel Engine Cylinders on the Micro Internal Grinder

developed by the Micro Machine Co., Bettendorf, Iowa. In the illustration this machine is shown grinding cylinders for Diesel engines. The range of bores that the machine is capable of grinding demands a wide variety of headstock and table speeds. By turning the circular dial on the front of the headstock, the operator can instantly set the planetary speed of the grinding head to suit the diameter of the hole being ground.

Like all Micro grinders, this heavy-duty machine employs the pantograph spindle drive which insures a constant peripheral speed of the grinding wheel. The hydraulic drive of the table provides traverse speeds ranging from a few thousandths of an inch up to several feet per minute. The main cylinder of the machine is 14 inches in diameter by 36 inches long. The eccentric throw is 4 inches.

A dust exhaust system is provided on the machine, in which there is a telescoping pipe which runs in a straight line from the intake of the suction exhauster to the work. At the work end this pipe is funnel-shaped to fit the cylinder being ground. The exhaust fan rests on a stand into which is built the three-horsepower motor of the system.

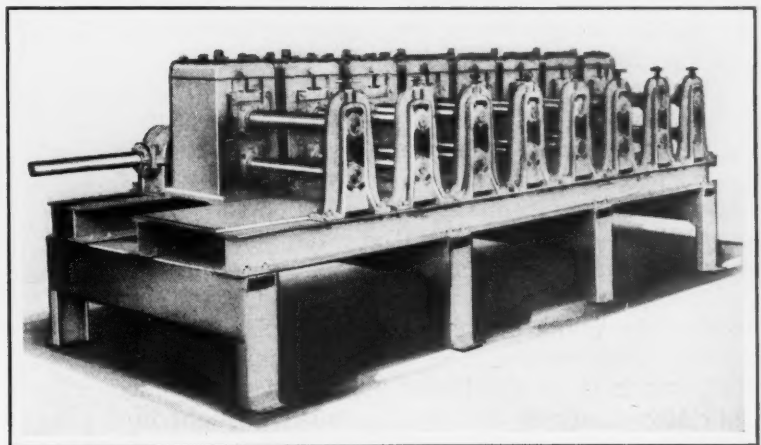
The table of this machine is 96 inches long, without the dust aprons, and 26 inches wide. The distance from the top

of the table to the center line of the grinding circle is 24 inches, but this dimension may be increased to suit the work. Lengthwise slots in the table top provide for the mounting of various types of work-holding fixtures. Steadyrest types of fixtures can be spaced to accommodate long or short work. The machine itself is driven by a 10-horsepower motor, operating at 1200 revolutions per minute. The machine weighs approximately 18,000 pounds.

FARREL-BIRMINGHAM METAL-FORMING MILL

A metal-forming mill that conforms closely to the design of continuous mills used for rolling hot bars and strips is a recent development of the Farrel-Birmingham Co., 344 Vulcan St., Buffalo, N. Y. Each stand of this mill is an individual unit and has an individual driving motor which transmits power to the rolls through bevel gears. The principal advantage of this construction is flexibility to suit various kinds of work, it being possible to add or subtract units from the mill for forming different metal shapes. On heavy production work a duplicate set of stands can be kept ready, so that as one production job is finished, the machine can be immediately changed over for other work.

Each stand houses the spindle bearings, connecting gears, and mechanism for adjusting the roll centers. To elevate or depress any top-roll spindle, it is only necessary to turn the hexagon head of a screw to the right or left. Both the stands and the gear-drive units are fitted throughout with anti-friction bearings and are lubricated automatically.



Farrel-Birmingham Forming Mill with Self-contained Roll Units

MOLINE CYLINDER BORER

The latest addition to the line of "Hole Hog" cylinder borers built by the Moline Tool Co., Moline, Ill., is intended for high production on one definite set-up. The design, therefore, deviates from the concern's standard practice of providing independent spindle units that are adjustable for obtaining different center distances between the spindles. Timken tapered roller bearings are provided for all spindles, and every running bearing in the machine is either of the roller or ball type.

In general the machine is similar to other "Hole Hog" boring machines in that the double V-guide construction is used, as well as the Oilgear feed mechanism with its cylinder located between the vees, and the pump enclosed within the column. The motor is mounted on top of the column and transmits power to the main drive-shaft through a Morse silent chain, power being then transmitted to the two vertical intermediate shafts through spiral gears. These vertical shafts are multi-splined and have pinions that mesh with gears on the spindles.

It is intended that the machine be used in pairs, for instance, two

roughers, one for one series of holes and one for the remaining holes. Likewise, it is intended that two machines be used for semi-finishing operations and two for reaming operations.

The work fixture is of a unique design; in Fig. 1 it is shown loaded and in the working position, while Fig. 2 shows the fixture swung forward into the position that it would occupy in line with a conveyor for conveniently discharging the cylinder. With very little effort the lever at the front center of the fixture can be raised to swing the entire cradle into the working position, and by turning the crank at the right of the fixture, two locating plungers are entered into the main crankshaft bearings of a cylinder block and two guide and clamp plungers are simultaneously brought into position. With this arrangement, cylinder blocks are accurately centered and clamped in place.

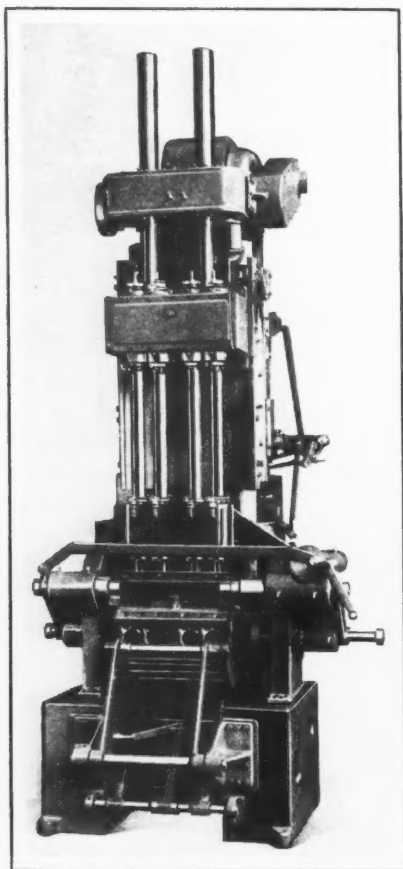


Fig. 1. Moline Cylinder Borer

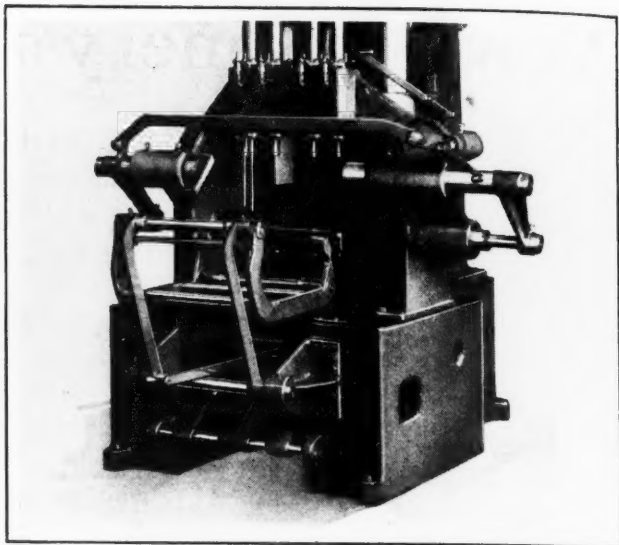


Fig. 2. Cradle Jig Swung Forward for Loading

In all cases the boring bars are made as long as possible. In roughing operations they are guided at the top of the fixture close to the work, while in semi-finishing operations they are piloted both above and below the work. In reaming operations, guides for piloting the tools are located at the bottom of the slide and the tools are not piloted directly in the fixture. The total weight of the machine, including the fixture and tools, is 17,350 pounds.

LITTELL STOCK REEL AND ROLL FEED

Two recently developed products of the F. J. Littell Machine Co., 4125-4127 Ravenswood Ave., Chicago, Ill., are a stock reel and a roll feed for small work. The stock reel, which is shown in Fig. 1, is of ball-bearing design and is intended for handling light spring stock up to about 1 1/2 inches in width. A large band around the outside of this



Fig. 1. Littell Ball-bearing Stock Reel

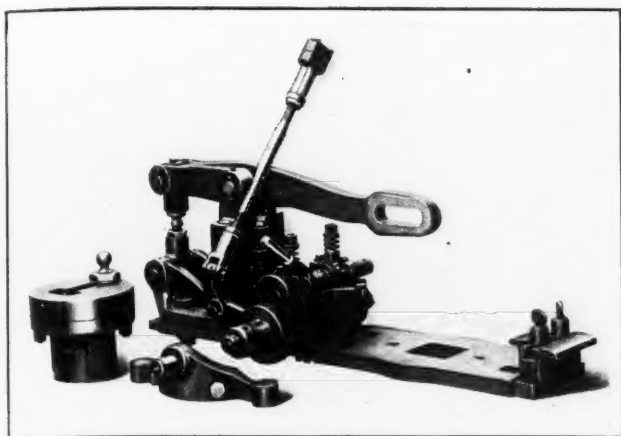


Fig. 2. Littell Automatic Roll Feed for Punch Presses

No. 1 reel restrains the stock, which is drawn from the inside of the coil.

Fig. 2 shows the roll feed which was developed to feed stock to punch presses for the production of radio and similar parts. When operating under average conditions in conjunction with a single die, this feed provides for the production of 80,000 parts in nine hours. Multiple dies, of course, permit higher production rates. The rolls are 2 inches in diameter by 2 1/2 inches long, and the complete feed, equipped with a scrap cutter, weighs but 160 pounds.

KENT-OWENS POWER-FEED MILLING MACHINE

A No. 2 power-feed milling machine with the spindle mounted in a head that can be fed vertically, has recently been placed on the market by the Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio. The spindle drive belt, which drives from the back-shaft, is equipped with an idler that main-



Kent-Owens Power Feed Milling Machine with Vertical Feed to Spindle

tains the proper belt tension for all positions of the head. Both the spindle and back-shaft are mounted in Timken tapered roller bearings. Pick-off gears provide different spindle speeds. The drive can be taken either direct from the countershaft to a two-step cone pulley on the back-shaft, or by chain from a motor mounted on the right-hand side of the column.

Power feed and hand quick return to the table are provided. Different feeds for the table are obtained by pick-off gears. The working surface of the table measures 7 inches in width by 28 inches in length, and the maximum distance from the spindle to the table is 17 1/8 inches.

A heavy flywheel-type pulley is used on the spindle to prevent chatter, and the entire head assembly is counter-balanced to facilitate rapid operation. Adjustable stops limit the head travel and trip-dogs engage or disengage the table feed. The machine weighs about 2600 pounds.

APEX TOOL-HOLDERS AND NUT SETTERS

The internal design of full-floating tool-holders recently brought out by the Apex Machine

Co., Dayton, Ohio, is shown in Fig. 1. This holder is intended for use in screw machines and automatics. Angular floating action is furnished by the upper balls, while parallel or sidewise floating action is provided by the lower balls. In each case, there are two rows of balls located in hardened and ground grooves positioned at right angles.

A semi-floating holder is also made, which has only the parallel floating action, and consequently is equipped only with the lower set of balls. These holders are equipped with an inserted socket in order to reduce the over-all length.

Apex universal joints have been adapted for setting nuts and cap-screws in inaccessible places, the socket end of the joint being made to fit over the end of the nuts, and the shank on the ball end being made to suit requirements. These universal joints operate at angles up to 30 degrees. Fig. 2 shows universal joints with both the straight shank, intended for welding to hand braces, and the special long shank having a hexagonal end for use in portable tools.

In Fig. 3 is shown a multiple-disk safety friction chuck with the shank designed to fit an electric or

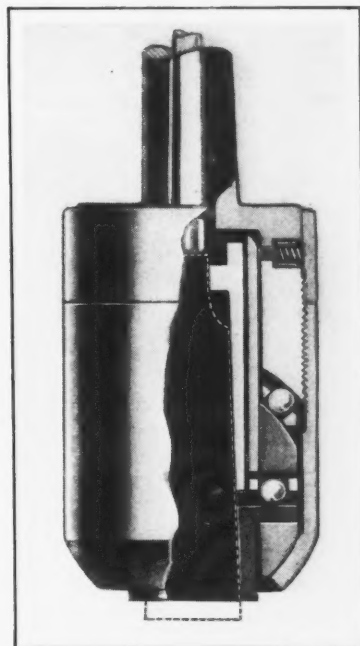


Fig. 1. Apex Full-floating Tool-holder

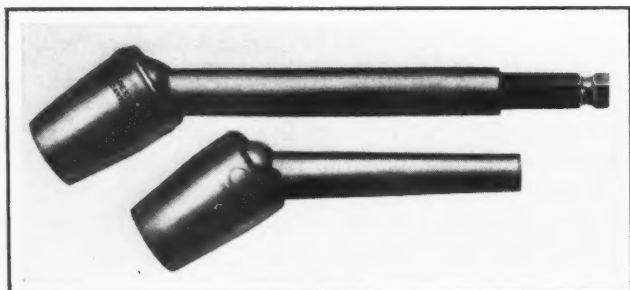


Fig. 2. Two Styles of Apex Universal-joint Nut- and Stud-setters

air-operated tool. The chuck is made to take socket wrenches, screwdriver bits, etc., of any make. The friction mechanism can be set so that the chuck will slip at the desired tension, and thus give uniform setting of nuts or screws.

DAVIS & THOMPSON CONTINUOUS PIPE-THREADING MACHINE

Pipe up to 4 inches can be threaded in a No. 3 "Rotomatic" continuous pipe-threading machine recently built by the Davis & Thompson Co., 57th Ave. and Mitchell St., Milwaukee, Wis. When installed in a plant ready for operation, ways will be provided on the operator's side of the machine on which from 5 to 7 tons of pipe can be loaded by a crane. The pipe will roll down to the conveyor of the machine, where fingers are arranged to pick it up, one piece at a time, and carry it to the rotating member of the machine on which it is clamped by a chain and then threaded during the rotation of the work-carrier. The machine has six spindles, each of which carries a threading die.

When the proper length of thread has been cut on a pipe, the die automatically opens and the spindle is withdrawn. Then, as the threaded pipe reaches a certain point, the clamps are automat-

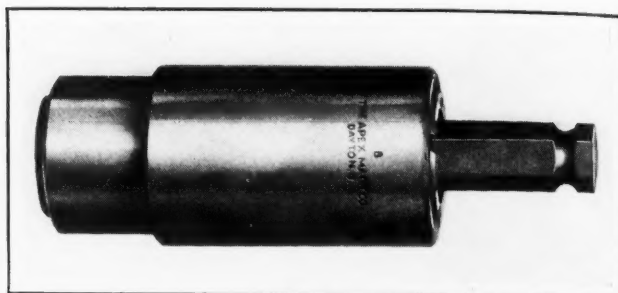


Fig. 3. Multiple-disk Chuck Adapted for Driving Nuts and Studs

ically released, allowing the work to drop out on cast-iron ways on which it rolls to the back of the machine.

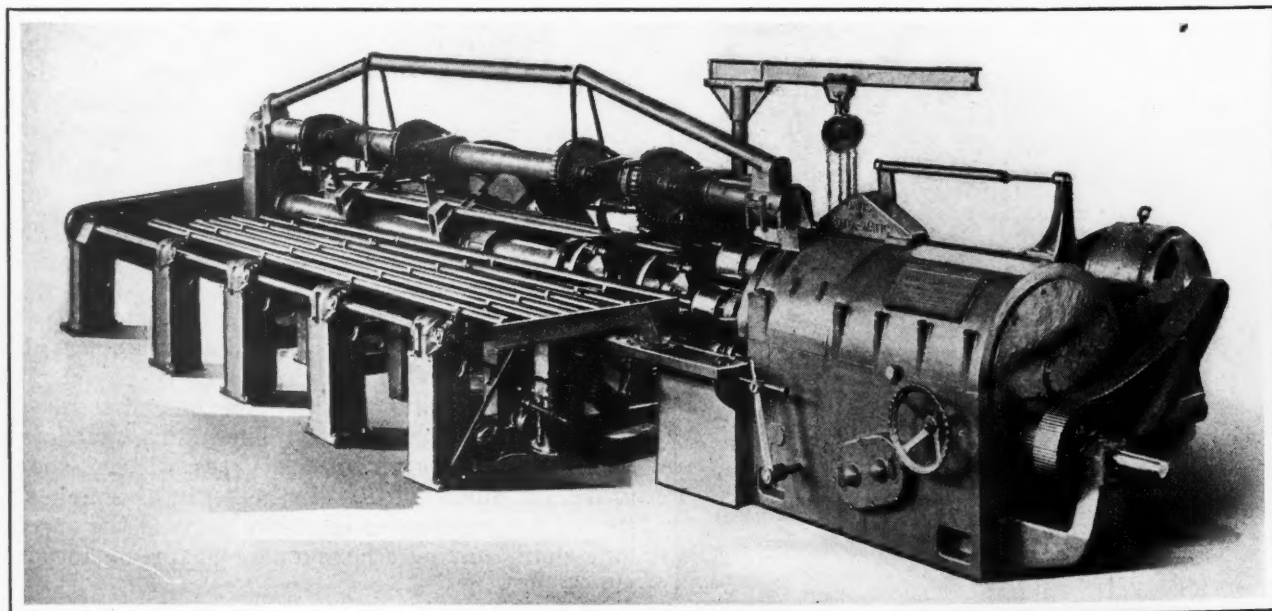
Lubricant for the dies is forced through the fixture at a high velocity, and serves to wash grit, scale, and dirt from the dies. Safety devices are provided which automatically stop the rotation of the machine should a pipe become clogged or stuck in a die, or should there be danger of damage through carelessness.

The machine is regularly equipped with a variable-speed motor, power being transmitted to the main drive shaft by a silent chain, and from this shaft, to a friction disk clutch operated by a handle in the front of the machine.

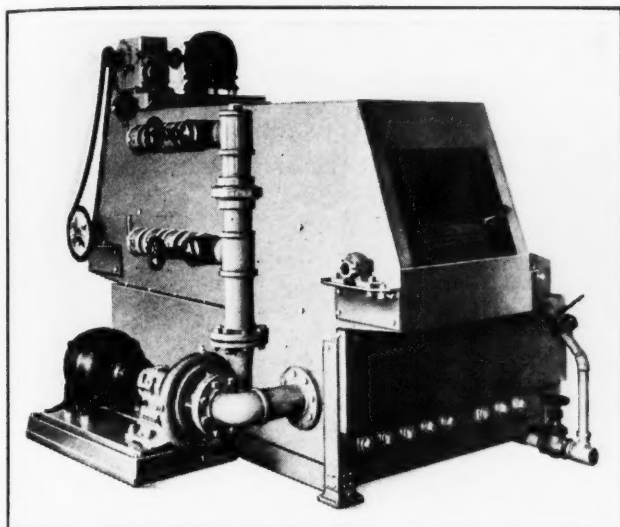
Sliding gears in the head of the machine give the proper spindle speeds for cutting pipe threads as small as 1 inch. A crane is attached to the machine for removing the die-heads, which weigh 400 pounds each. The total weight of the machine is 60,000 pounds.

COLT "AUTOSAN" METAL PARTS CLEANER

A two-tank conveyor type of machine for cleaning metal parts, which has recently been added to the line built by the Colt's Patent Fire Arms Mfg.



"Rotomatic" which Threads up to 4-inch Pipe



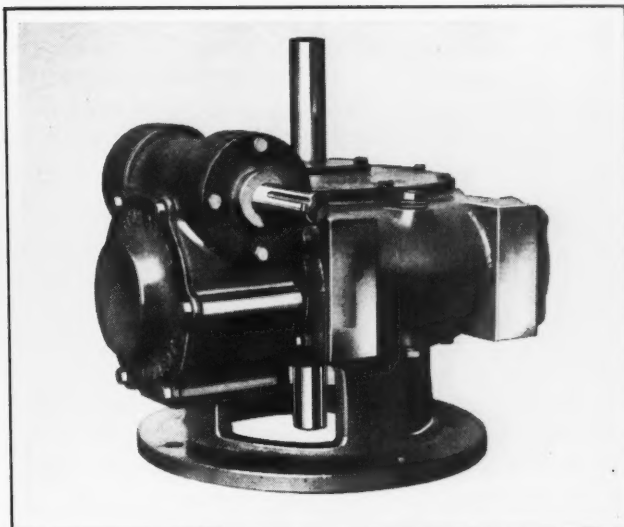
Colt Two-tank "Autosan" Cleaning Machine with Conveyor of Special Type

Co., Hartford, Conn., is here illustrated. The particular features of this equipment are the large tank capacity; the manner in which the cleaning solution is returned for re-circulation; the constant control of the water and pressure both above and below the parts being washed; and the accessibility of the tanks, solution, and moving parts.

The conveyor is constructed of strong, specially woven material that eliminates the possibility of small parts dropping through or becoming caught in it. This conveyor is especially adapted for use in cleaning small parts laid directly upon it. Its construction allows for the complete cleaning of parts, as the force of the water is not restricted.

SIMONDS HACKSAW BLADES

A new line of hacksaw blades intended for use on both hand- and power-operated machines is being introduced to the trade by the Simonds Saw & Steel Co., Fitchburg, Mass., under the trade name of "Red Streak." The principal claims made for these blades are that they are manufactured from a steel having unusually high wear-resisting properties and that the teeth are so shaped that they have the ability to stand up under severe metal-cutting operations. The blades are distinctively marked with a red end.



Compound Vertical Speed Reducer Marketed by the Boston Gear Works Sales Co.

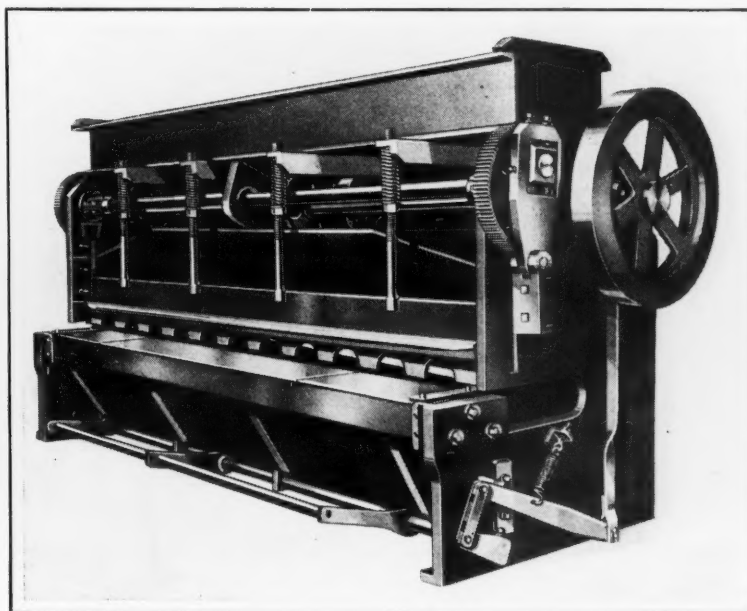
COMPOUND VERTICAL SPEED REDUCERS

High ratios are obtainable in a type V-W series of compound vertical speed reducers now being placed on the market by the Boston Gear Works Sales Co., Norfolk Downs (Quincy), Mass. These reducers are made in four sizes for reductions up to 4000 to 1. Hardened and ground steel worms and phosphor-bronze worm-gears are employed in these reducers, and they are equipped throughout with Timken tapered roller bearings to take care of all thrusts.

DREIS & KRUMP OVERHEAD-DRIVE GAP SHEAR

An overhead-driven, gap type "Chicago" power squaring shear, recently placed on the market by the Dreis & Krump Mfg. Co., 74th St. and Loomis Blvd., Chicago, Ill., is of all-steel welded construction like the under-drive shear that was described in April, 1929, *MACHINERY*, page 630.

The gap feature, which is possible only on the overhead-drive type of shear, permits the cutting of sheets that are longer than the rated cutting length of the shear by passing the sheet through the gap in the housings after each stroke of the upper knifebar. The width of a long sheet cut in this manner is governed by the

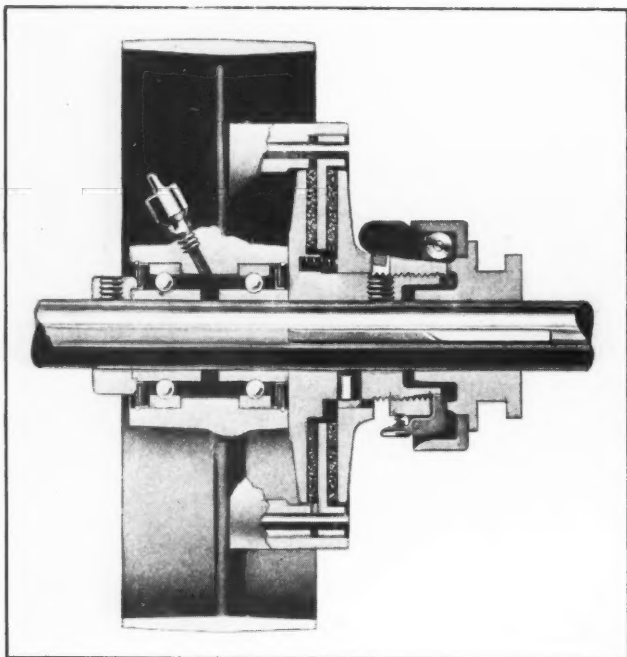


Dreis & Krump Gap Shear of All-steel Welded Construction

depth of the gap, which is made in two regular sizes of 18 and 24 inches.

There is a simple adjusting means for the upper knife. For sheets that are cut with one stroke, the blades are adjusted to pass each other at the finishing point, while in shearing sheets requiring more than one stroke, the blades are adjusted to meet within the thickness of the material sheared, at the finishing point.

The overhead-drive shear is arranged for a direct-gear motor drive. Timken tapered roller bearings on the flywheel shaft insure ease of operation. The uniform pressure hold-down, for clamping the work, equalizes the heavy clamping pressure. These gap shears are regularly made in sizes ranging from 5 feet 6 inches to 16 feet 8 inches in length.



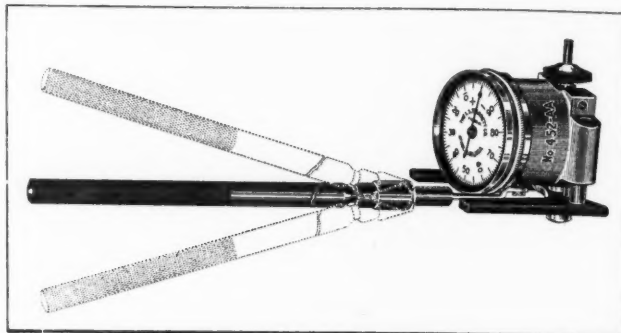
Edgemont Disk Clutch with Convenient Hand Adjustment

EDGEMONT DISK CLUTCH

A type SF disk clutch recently brought out by the Edgemont Machine Co., 2700 National Ave., Dayton, Ohio, is provided with a single adjustment which can be manipulated by one hand without the use of tools. Adjustments are made by simply pressing down on a lock lever and turning a part until the lock lever snaps into the next slot.

The clutch is intended for a variety of applications ranging from countershaft installations to machine applications where either low or high speeds are transmitted. It is capable of picking up the load either slowly or quickly. The mechanism is provided in a complete line of pulleys with either oil-sleeve bearings, Timken tapered roller bearings, or Fafnir transmission ball bearings, and also in cut-off couplings. The clutches are also made with extended sleeves on which pulleys, sheaves, gears, etc., can be mounted. The mechanisms alone can be furnished to those who desire to make their own mountings.

Renewable asbestos metallic liners of large friction area are employed. The clutch is so designed that it is impossible for centrifugal force to cause it to engage or to drag at any speed. Levers exert pressure on the plate without any sliding action. The rollers are mounted in long levers to provide easy operation so that the driven member of a machine can be "inched" along.



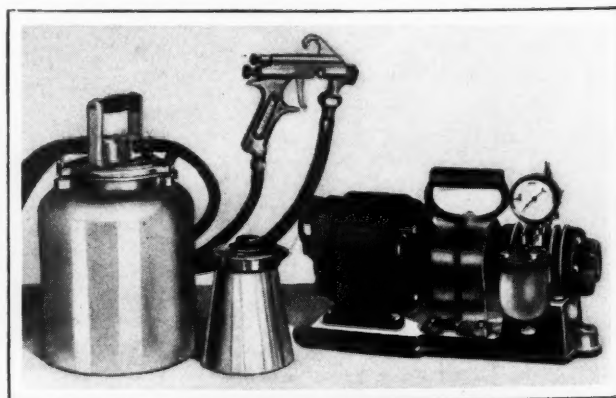
Starrett Cylinder Gage for Small Bores

STARRETT CYLINDER GAGE

A cylinder gage for measuring small bores from 1 7/8 to 2 1/2 inches is a recent product of the L. S. Starrett Co., Athol, Mass. This No. 452AA Junior cylinder gage is shown in the accompanying illustration. It functions in the same manner as the larger Starrett gages Nos. 452A and 452B. The sled and contact points are made of hardened and ground steel. A double spring action provides self-centering and non-collapsible features. The adjustable dial is marked plus and minus, and is calibrated in thousandths of an inch.

PORTABLE SPRAYING EQUIPMENT

A portable sprayer termed the "All-Purpose Sprayit," which is suitable for applying lacquer, enamel, varnish, or paint to large surfaces of machines, automobiles, etc., has recently been added to the line of hand equipment made by the Electric Sprayit Co., 320 E. Colfax Ave., South Bend, Ind. This sprayer has a rotary compressor which is driven direct by a 1/4-horsepower motor. The sprayer is also obtainable with a 3/4-horsepower air-cooled gasoline-engine drive.

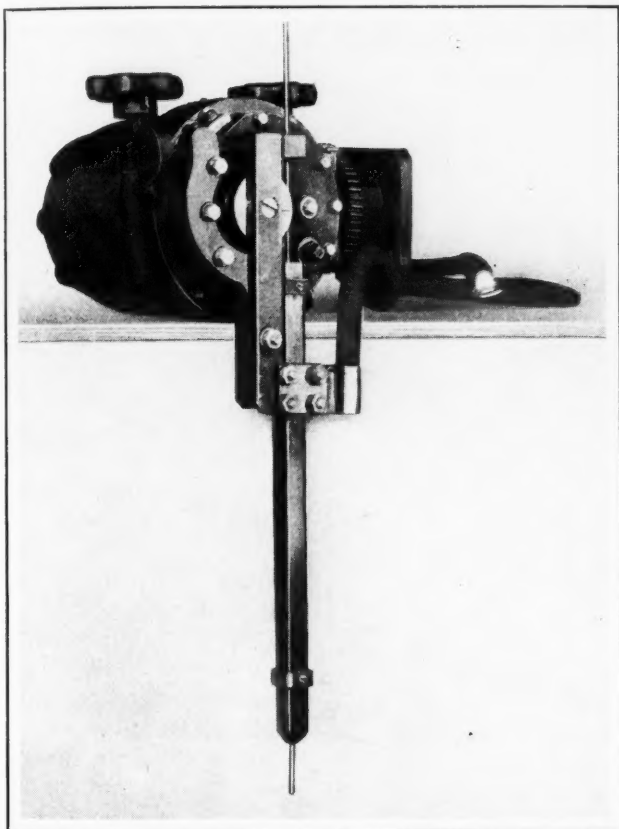


All-purpose Electric "Sprayit"

The compressor delivers 5 cubic feet of air per minute. The pressure feed tank holds approximately two gallons of material, which is sufficient to cover a surface of 700 square feet. A one-quart container which can be connected direct to the spraying gun is provided for small jobs. The complete outfit, in the electric type, weighs approximately 50 pounds, and in the gasoline-engine driven type, approximately 70 pounds.

WESTINGHOUSE "WELDOMATIC" OUTFIT

Positive feed without slippage, instantaneous response to arc voltage conditions, a wide range of



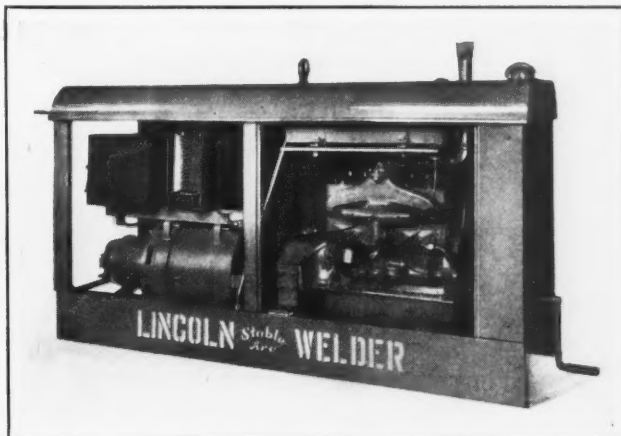
Westinghouse Automatic Arc Welding Outfit

speeds, compact design and light weight, ease of adjustment, and smoothness of operation are some of the features claimed for an automatic arc-welding outfit known as the "Weldomatic," which has recently been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The equipment consists of an electrode feeding device, control cabinet, and operator's panel.

On pressing a button, the "Weldomatic" automatically strikes and holds an arc between an electrode and the work to be welded, without other assistance from the operator. A rheostat controls the arc voltage, which is recorded on a voltmeter. A switch on the panel permits the operator to reverse the direction of the head motor for withdrawing the electrode from the work under power. A motor-generator set controls the head motor, changing its speed and the direction of the electrode feed as required by the arc conditions.

LINCOLN GAS-ENGINE-DRIVEN WELDER

The Lincoln Electric Co., Cleveland, Ohio, has recently introduced to the trade a 200-ampere welder to which power is supplied by a four-cylinder Waukesha gasoline engine which operates at a speed of 1500 revolutions per minute. An auto-



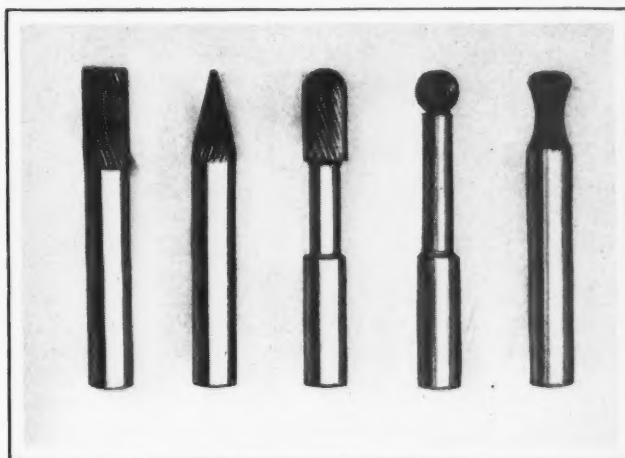
Lincoln Arc Welder Driven by Gasoline Engine

matic idling device reduces the engine speed when welding operations are stopped, and accelerates the speed the proper amount when welding is resumed. It is estimated that this automatic control reduces the fuel consumption approximately 25 per cent, besides reducing wear.

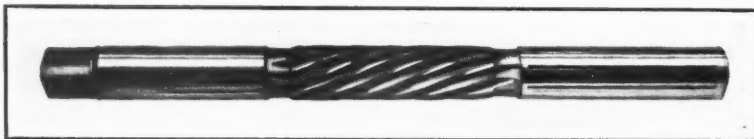
Protection is afforded to the machinery by the welded steel canopy which totally encloses the outfit when the side panels are in place. The illustration shows the outfit with the panels removed. A ventilated steel cabinet encloses the operating controls.

"PROFILO" ROTARY FILES

Twenty-two shaped files have been added to the line of "Profilo" straight rotary files made by the Rotary File Co., 14,063 Welland Ave., Detroit, Mich. Several of these tools are shown in the accompanying illustration. These files are intended for use in making metal molds, dies, metal patterns, and similar parts.



Rotary Files for Use in Die-sinking and Similar Operations



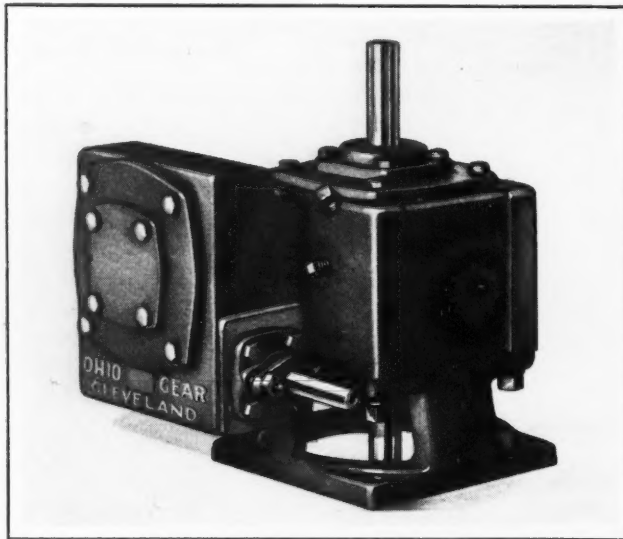
"Red Line" Reamer in which Both the Fluted Section and Pilot can be Expanded

The teeth of the files are milled and generated and are cut to a steep left-hand helix angle in order to avoid chattering and hogging-in. It is claimed that this steep angle and a fairly coarse tooth pitch gives a smooth finish at a fast cutting speed. All the tools have 1/4-inch shanks. They can be used with flexible shafts, in profiling machines, or in drilling machines.

OHIO SPEED REDUCERS

The line of single reduction units made by the Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio, has recently been supplemented by a line of double speed reducers, one of which is shown in the illustration. The double speed reducers are made with both shafts horizontal or with one shaft horizontal and one vertical as illustrated.

Timken tapered roller bearings are used throughout, the same as in the single reducers. Hardened and ground worms and bronze worm-wheels are employed. The reducers are regularly made in three different case sizes having different ratios and torque capacities. The available ratios range from 1 to 100 up to 1 to 24,000, and the torque capacity from 100 up to 3200 inch-pounds.



Ohio Double Speed Reducer

"RED-LINE" PILOT- AND FLUTE-EXPANSION REAMERS

Both the pilot and cutting section of a reamer being placed on the market by the Red Line Reamer Co., Millersburg, Pa., can be expanded. This reamer is manufactured in various sizes from 1/2 to 3 inches, and is particularly adapted for line-reaming holes. Typical operations include the reaming of piston-pin and steering-knuckle holes.

Expansion of the fluted section is obtained by adjusting a screw in the shank end of the tool, while the pilot is expanded by adjusting a screw in the pilot end. On the 1-inch size, an expansion of 0.015 inch

is obtainable. The expansion slots of the fluted section extend into the shank for lubricating purposes.

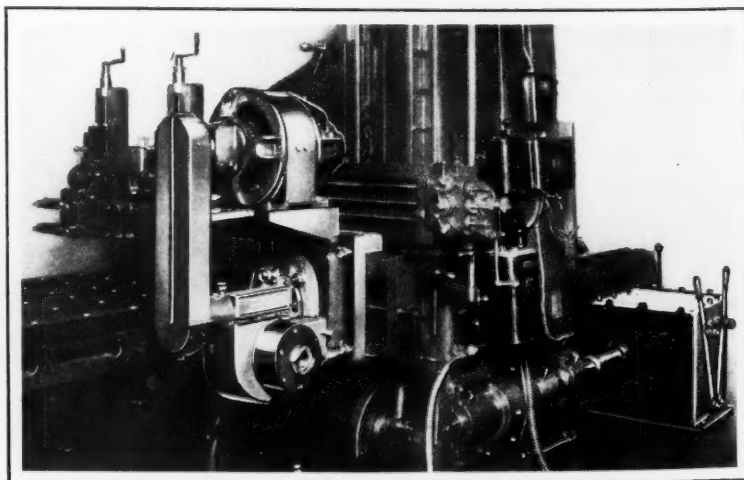
ADAMS MILLING EQUIPMENT FOR PLANERS

Equipment brought out recently by the Adams Co., 1905 Market St., Dubuque, Iowa, combines the facilities of a large planer-type miller with those of an ordinary planer, so that it is possible to perform both planing and milling operations at one setting of the work. The equipment consists primarily of a milling head, a saddle for mounting the milling head on the planer rail, and a gear-box that furnishes the necessary reduction in table speeds.

The illustration shows the equipment installed on a Cleveland open-side planer. The milling head is applicable to a side-rail as well as a cross-rail. In this instance, the saddle has an overhanging bracket for supporting the electric motor which drives the milling spindle, but a plain saddle and the necessary countershaft equipment can be supplied, if a belt drive is desired. The milling head is furnished in three sizes for application to any size or make of planer. It can be set for either horizontal, vertical, or angular milling.

The gear-box may be seen in the lower right-hand corner of the illustration, mounted on the floor between the driving motor and the planer.

For planing operations, a clutch is engaged to give the normal table speeds. By throwing out the clutch and manipulating the gear shaft levers, a variety of reduced speeds are available for milling.



Adams Milling Equipment Applied to an Open-side Planer

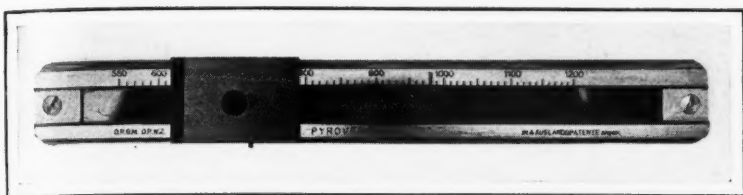


Fig. 1. Maco "Pyroversum" Optical Pyrometer

MACO "PYROVERSUM" OPTICAL PYROMETER

"Pyroversum" is the name given to a pocket-size optical pyrometer placed on the market by the Maco Template & Engineering Co., 19 Cursitor St., London, E. C. 4, England. This pyrometer is intended for use in foundries and shops for determining the temperature of molten metals and heated tools.

The instrument consists primarily of a frame 8 1/2 inches long, as shown in Fig. 1, which is provided with a special glass that is clear at one end but becomes gradually darker until at the opposite end it is practically opaque. On one side of the frame is a scale registering from 550 to 1200 degrees C. This frame can be supplied with Fahrenheit calibrations, when desired. On the frame there is also mounted a slide having a circular hole in which a shaded glass is fitted through which the work can be viewed at any convenient distance. The slide is moved along until the glow of the heated work can no longer be seen. The temperature is then read on the scale graduation at the left-hand side of the slide. Fig. 2 shows a protective eye-piece used with the instrument.



Fig. 2. Protective Eye-piece Used with Pyrometer

BROWN & SHARPE GEAR-HOBGING MACHINE

The Brown & Sharpe Mfg. Co., Providence, R. I., has recently announced the redesign of the No. 34 gear-hobbing machine and the incorporation of several new features. This machine, which is here illustrated, is now of the motor-in-base type and is equipped with an oil filter located at the rear of the machine where it can be easily cleaned. Oil is pumped from the feed-case through the filter to the indexing mechanism and the feed-case bearings, from where the overflow is drained back to the feed-case supply.

The cutter coolant pump is located at the rear of the feed-case where it is readily accessible. It is driven by a chain from the driving pulley shaft, and can be easily disconnected when cutting cast iron. Anti-friction bearings are used at all important points throughout the

machine, including the indexing mechanism, the driving pulley shaft, and the hob driving shaft. If desired, the machine can be driven from an overhead shaft running at 500 revolutions per minute.

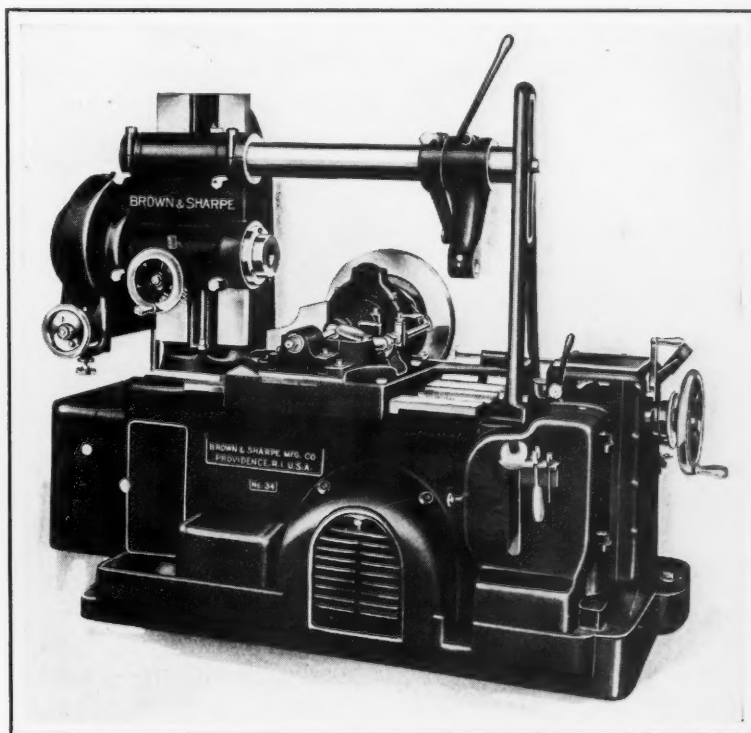
* * *

THE GENERAL ELECTRIC CO.'S PENSION PLAN

Under the pension plan of the General Electric Co. the average annual earnings of an employee during the last ten years are used as a basis for the computation of the pension. One and one half per cent of the average annual earnings during this period is multiplied by the number of years of service that the employee has rendered the company, and the amount thus obtained constitutes the annual pension paid. Under this plan about \$2,500,000 has so far been paid to retired employees. There are now approximately 1000 former employees receiving pensions or disability relief.

* * *

About 250 American engineers will attend the World Engineering Congress in Tokio, Japan, this fall. The American committee of the congress of which Elmer A. Sperry, president of the American Society of Mechanical Engineers, is chairman, will sail with the other delegates from San Francisco on the *President Jackson* and the *Korea Maru* on October 10. A large number of European engineers, who have visited this country on their way to Japan, will also join the party.



Brown & Sharpe Gear-hobbing Machine Recently Redesigned

Current Editorial Comment

In the Machine-building and Kindred Industries

APPRENTICE TRAINING IS A JOINT RESPONSIBILITY

While some machinery manufacturers have been successful in maintaining apprentice systems over a long period of years, carrying on their training courses alone and without cooperation with others, it has been discouraging to them to see the young men whom they have trained hired by other shops in the same locality who do not train apprentices.

Recently the machinery and metal working industries have come to see more clearly that the training of mechanics in any industrial district is the joint responsibility of all the manufacturers there, and is not an individual shop problem. For a long time the National Metal Trades Association has advocated this new principle, but it remained for the Milwaukee Branch of the association to put it into actual practice. During the past seven years all the important machine-building and kindred plants in Milwaukee have cooperated in training apprentices, with the result that the number trained in metal-working plants there has grown from 460 in 1922 to about 1100 at the present time. The quality of the training also has improved, and Milwaukee is setting an example that is of distinct benefit to all of our industrial communities.

The Milwaukee plan of apprentice training has been described in several articles published in *MACHINERY*. Harold S. Falk, vice-president and works manager of the Falk Corporation, who has been chairman of the Apprenticeship Committee of the Milwaukee Branch of the National Metal Trades Association since the inception of this co-operative effort, and who has largely been responsible for its success, has been appointed chairman of the Committee on Industrial Education of the National Metal Trades Association. In this extended field his knowledge of apprentice training methods, his interest in this important question and his ability to secure results, will be of the greatest value.

* * *

ALLOWANCES ON CASTINGS AND FORGINGS

Some time ago a large manufacturing concern overhauled its patterns for the purpose of reducing time wasted in machining castings, because too great allowances had been made for machining. It was found possible to reduce the allowances made on the patterns considerably, and about one-third of the time formerly spent in machining will be saved by this concern in the future.

It is customary in many shops to make generous allowances on patterns and forging dies, to make sure that the castings and forgings will "clean up"

when machined; but very often these allowances are too generous, and unnecessarily increase the cost of machining. At times it may be found cheaper occasionally to scrap a piece that will not "clean up" than to have to remove perhaps twice as much material as necessary on the rest of the pieces. Quite often money would be saved if everyone, from designer to machine operator, were not afraid to have a single piece scrapped.

The two principal sources of waste in machining are the use of inefficient machine tools that remove metal too slowly, and too great allowances on castings and forgings that increase the amount of metal to be removed. Hard and fast rules cannot be laid down for the most economical allowances, as they will vary according to the size of the piece, the material from which it is made, and the purpose for which it is to be used; but a thorough examination of all patterns and forging dies should be made to avoid excessive allowances.

* * *

AN INCREASE IN OVERHEAD MAY REDUCE COSTS

As so much has been said about the importance of keeping down overhead charges, many shop managers are under the impression that the only way to reduce manufacturing costs is to keep the overhead expense as low as possible. This is not always true. The percentage of overhead expense in a high-production automobile plant is much greater than in a small jobbing shop; but the manufacturing cost per piece in the high-production shop is much less.

If production warrants it is often possible to reduce costs by increasing overhead. The installation of new machines and other shop equipment will make it possible to produce faster and at less cost per piece, although overhead charges are increased thereby. The employment of time-study men increases overhead, but has proved very effective in many shops in reducing costs. In the smaller jobbing shops, the employment of a draftsman or two would often prevent costly mistakes from being made. It is cheaper to change a drawing than to change a machine after it is built. The draftsman's wages increase overhead, but tend to reduce costs. For the same reason metallurgical and research laboratories have paid for themselves in many plants.

There is no need to worry about increasing overhead charges if the cost of production is being reduced meanwhile. But keep your eye on the overhead and eliminate expenses that are not necessary for efficient operation.

The Need for Skilled Workmen in Industry

How the National Metal Trades Association Builds for the Future by
Promoting a Carefully Planned Program of Apprentice Training

By HAROLD C. SMITH, President, National Metal Trades Association

THE acute shortage of skilled craftsmen in practically all American industries during the past decade has been nowhere more keenly felt than in the metal trades. According to an analysis made by the National Metal Trades Association, the diminished supply of old-time, all-around skilled journeymen is not the result of a single cause, but a manifestation of progressive industrial development. No less than seven distinct causes have been instrumental in bringing about the present predicament. They may be summarized as follows:

1. *The Tendency to Specialize*—Mass production methods necessitate a certain amount of specialization, and to no small degree the extension of the machine-paced production idea has been responsible for the appearance of a class of labor that is neither skilled nor unskilled, but that nevertheless maintains the bulk of production. Large numbers of men who otherwise might have become skilled craftsmen have naturally drifted into work of this kind.

2. *Unstable Employment*—Periods of depression in an industry, such as that of 1920-1921, and even minor fluctuations, such as that of 1924, especially when accompanied by unusual activity in other lines or the development of entirely new industries, serve to induce high-calibered men to leave an industry or trade and seek employment elsewhere.

3. *Demands of New Industries*—Extraordinary expansion in the automotive industry, the development of the radio, the airplane, and now the talking movies, are typical examples of the growing field of employment offered to skilled workmen, each drawing from older trades a portion of their trained personnel. Not only do these new industries attract the skilled craftsmen, but even more

strongly have they attracted the young men who might otherwise have developed into journeymen in the older trades.

4. *Restricted Immigration*—Not the least important of the effects of America's policy of re-

stricted immigration is the shutting off of a supply of skilled workers from abroad—largely men who learned their trade by serving a rigorous and thorough apprenticeship.

5. *High-production Equipment*—The application of inventive minds to problems of production is constantly increasing the amount of automatic and semi-automatic machinery and equipment in use. While such devices are largely manned by semi-skilled labor, highly skilled men are required for tooling, set-up, and maintenance. The demand for this class of skilled men in other industries constitutes another drain on the ranks of all-around journeymen in the metal trades.

6. *Supervisory Demands*—With the expansion of industry, coincident with a reduction in the number of

skilled employees, it follows that greater numbers of foremen and other supervisors are appointed from the ranks of journeymen workers.

7. *Changing Requirements of Skill*—Concurrent with the increasing demands for skilled labor, the widespread use of precision instruments and the refinement of machine tools and production equipment have effected a change in the very nature of the skill required of a journeyman. The skilled craftsman today must not only have considerably more technical knowledge, but must also be able to perform operations entirely unknown to his predecessor. Thus it is becoming increasingly difficult for older journeymen to keep up with trade progress and development, and for employers to



Harold C. Smith, President National Metal Trades Association, President Illinois Tool Works

find applicants for work who can be economically trained through mediums other than carefully prepared apprenticeship programs.

Carefully Planned Apprentice Systems are the Only Solution of the Problem

It is in recognition of the changing nature of the metal trades journeyman's work that the National Metal Trades Association has for ten years taken an active part in promoting industrial education, especially apprenticeship. The association's educational and training policies and their practical application have been made the responsibility of a committee of four executives, of that many member companies. These men are chosen because of their practical experience in handling manufacturing problems, as well as for their active connection with industrial training in their respective plants. Under the guidance of this committee, there is maintained a special department of industrial education, which is in charge of a departmental director, and he, with his assistants, carry out the policies laid down by the committee and officers of the association.

One of the phases of the department's work is to make community and plant studies to determine the training needs, the value of existing programs, and the potentialities for training possessed by individual plants or by plants in a community as a group. Following a study of this kind, an educational program is drawn up to meet the local requirements. Counsel and assistance is given the personnel selected to administer the program, to assure the proper coordination of the educational training and other shop administrative functions. In some communities, arrangements are made with the vocational departments of public school systems to give classroom instruction. An arrangement of this character is especially desirable for small companies that do not have enough apprentices to justify employing a man as classroom instructor.

The department also prepares reference texts and publications to promote and supplement plant training programs, and suggests suitable record-keeping devices and special instruction material. In addition, the department acts as a clearing house for training supervisors and directors of industrial training, keeping abreast of developments in the field of industrial and vocational education.

Essential Factors in a Successful Apprentice Program

Certain conclusions, naturally, have been drawn from experience in this field, one of which is that the most important phase of an effective apprenticeship program is individual responsibility for its success. This applies to the man in charge, regardless of whether the program is conducted by an association, a group of employers, or by an individual firm; but he need not be given full authority to establish policies—that usually is best done by a committee of two or more executives.

Experience further leads us to believe that an effective apprentice training program is practically assured when the following features characterize it:

1. Careful consideration and selection of applicants.

2. Testing of the applicant's fitness and capacities during a probationary period of employment.

3. Use of a suitable contract or indenture, *one that includes definite schedules of work and wages.*

4. Schedules of work so designed that they provide the proper amount of information and experience on machinery and in methods of work, and elimination of time-worn practices that require apprentices to do work that has little training value.

5. Day-time related-subject instruction (classroom work) in shop mathematics, mechanical drawing, trade science, economics, and English.

6. Due recognition of graduate apprentices' ability, and wage payment comparable to that of journeymen of equal ability.

The Opportunities that Present Themselves to the Properly Trained Man

Severe competition in business undoubtedly will continue, and probably will become even keener during the next few years. The men and firms that succeed will be the ones that have planned well. Industrial leaders fully recognize the need for competent men who can improve present types of machinery and revise manufacturing processes. It is only natural that they should expect the youth of today to develop into men capable of making those improvements. Young men of today who properly equip themselves for this period of competition may hope to enjoy a good reward and to share in a new era of prosperity.

The tremendous scope of industry and the vast opportunity for advancement it presents should interest any thoughtful young man. Furthermore, he should be impressed and encouraged by the fact that many of our country's industrial leaders have begun their business careers as apprentices.

In my opinion, the youth of today has a rare opportunity. That many future executives will come up through the ranks, as have so many leaders in the past, is certain. In fact, I believe the present-day youth can achieve more than did the older generation, but it is obvious that he cannot avoid hard, conscientious labor, if he would win recognition. No matter what occupation a young man elects to follow, he must combine enthusiasm and ambition, study and practice, or otherwise he will not rise above the average workman. Above all things, he must plan his course of action and then devote his energies to it. Many young men work untiringly, but without any plan or objective, and think that they should succeed simply because they are working hard and with fervor. A well planned program, as well as hard work, is necessary.

Apprentice Training is of Equal Importance to the Individual, to Industry, and to the Community

The serving of an apprenticeship is the first step of such a program; but it is only the beginning, the forerunner of many better and harder things that are ahead of the young man who has foresight to develop a program that is economically sound.

Once his program has been prepared, he should strive to accomplish it regardless of difficulties and disappointments. Eventually he will be repaid for his efforts and will be justly proud of his achievement.

In addition to being important to industry and to the individual, apprenticeship is also important to the community. A community prospers in proportion to the prosperity of the individuals who compose it. The moral, mental, and physical development of individuals produces better citizens, persons who are assets to their community, to their country, and to their age. It gives me much satisfaction to know that many forward-looking employers now appreciate the importance of these facts and are extending their training facilities, and it is my firm conviction that industrial training will continue to grow in scope and effect.

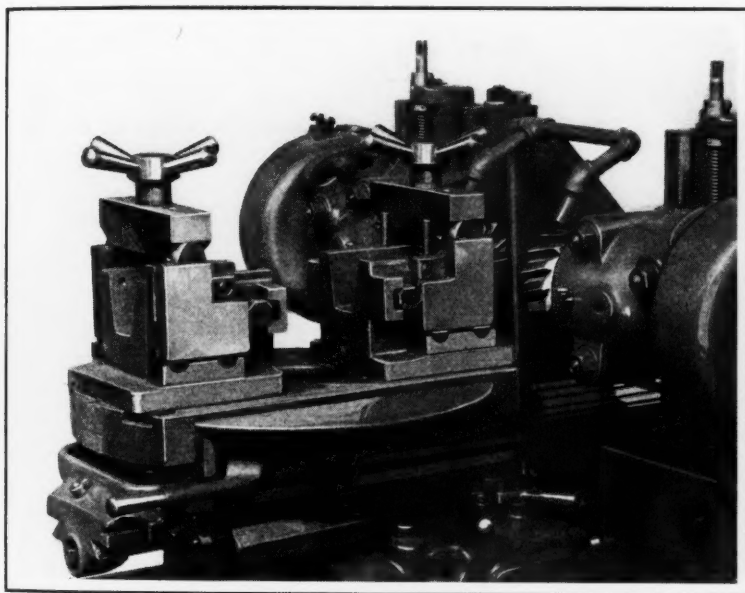


Fig. 1. Duplex Milling Machine, Index Base, and Fixtures for Milling Toggle Bases at the Rate of 73 Pieces per Hour

* * *

MILLING PRINTING PRESS TOGGLE BASES

High-production tools are not necessarily suited for large lots only. It can be shown that, by using foresight in the selection of the machine tool equipment itself, the design of the work-holding tools in most instances may be such as to be economical for rapid production on small lots also. This point is illustrated by the milling operation described in the following.

Two simple fixtures, like the one shown in Fig. 3, are mounted on a standard index base on a Cincinnati duplex milling machine, as illustrated in Fig. 1. Each fixture has provision for holding two toggle bases. These bases, which are parts of a printing press and made from cast iron with

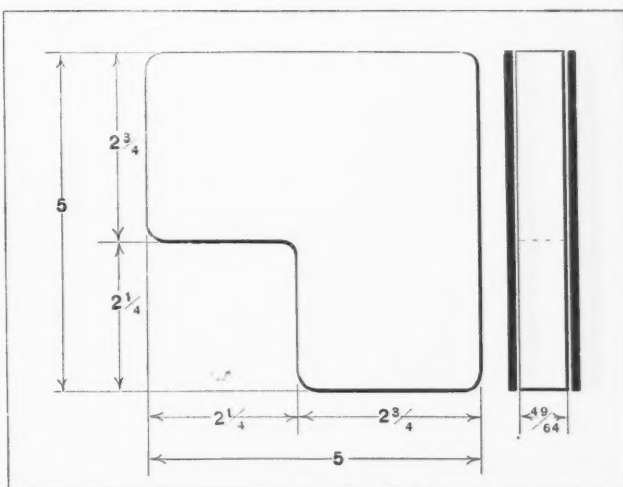


Fig. 2. Toggle Base Milled in Fixture Shown in Fig. 1

an admixture of 20 per cent steel, are shown in detail in Fig. 2.

The milling operations, of which there are two, consist of finishing both top and bottom, 1/16 inch of stock being removed. The bases are placed in the fixture with one edge resting on the two supporting plugs A, Fig. 3, the stop B taking the cutter thrust. The clamping action is an interesting feature, inasmuch as both the supporting plugs and the plungers C have a tendency to carry the work against the face of the fixture when the clamp is tightened. With this arrangement, the bases are removed and replaced in one fixture while those in the other are being milled, thus finishing one side of two bases at each pass of the work by the cutters. The finish-milling of the opposite sides, is done with the same tools. The production is seventy-three pieces per hour. This fixture is also suitable for milling diagonal blocks of similar shape to the bases.

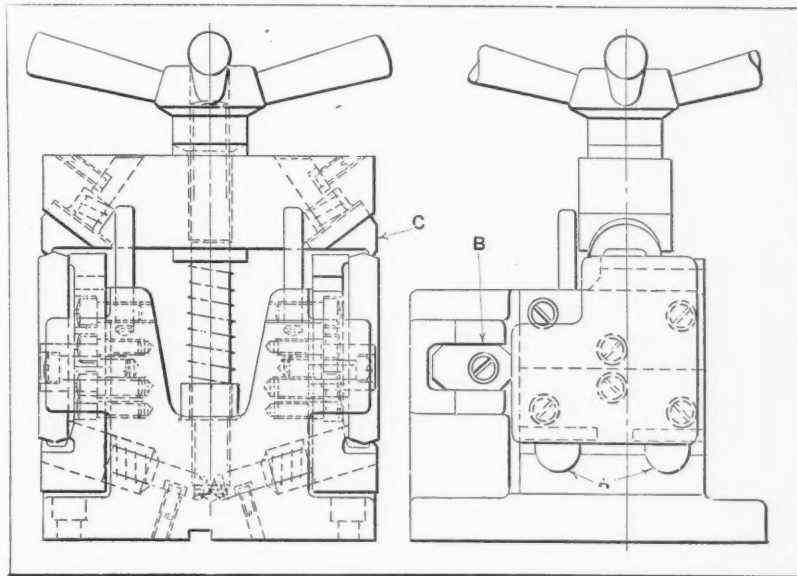


Fig. 3. Construction of Fixture Used in the Set-up Shown in Fig. 1

What the Master Tools of Industry Produce

A Brief Review Indicating the Magnitude of the Industries in the United States that Make Use of Machine Tools

WHAT do the master tools of industry—the machine tools used in some 20,000 machine shops throughout the country—actually produce annually? We know that they are the basic machines, the machines by which all other machinery is built; hence, their intrinsic value in the scheme of production, industry, and civilization cannot be computed in figures. But as a mere statistical evaluation, are the products turned out by the aid of machine tools a large part of the industrial production of the country? Do the industries that directly employ machine tools support a large number of the industrial population? Or, although this industry is technically important and fundamental, is it comparatively small and unimportant when measured by the yardstick of the statistician, in dollars and cents?

The Machine Shop Industries Lead All Others in Magnitude

The answer is very simple. The industries that directly make use of machine tools show a greater value of product and employ more men than any of the other industries in the country. If we group together the shops that produce machinery of all kinds; those that make transportation equipment, in the building, repairing, and maintaining of which machine tools are used (without, however, including garages and automobile service stations); and those that produce metal articles and parts, we find that approximately 20,000 shops are engaged in these branches of industry. These shops employ over 1,800,000 wage earners, and the total value of the products is approximately \$12,000,000,000.

Statistics make dry reading, but it is not possible to present a picture of the relation between the great machine tool using branches of the industrial field and other industries without the use of some statistics. The next largest industrial group is that which produces food and kindred products. Its output is valued at \$11,000,000,000 a year, and it employs nearly 700,000 wage earners. The textile industry comes next with an output of \$9,000,000,000, and employing 1,700,000 men and women.

The total value of the products of the manufacturing establishments of this country aggregate about \$63,000,000,000. The machine shop field—

the field that makes use of the master tools of industry in turning out its products—is responsible for approximately 20 per cent of the total industrial output of the United States. Through its 1,800,000 workers, this industry supports directly a population of approximately 10,000,000 people.

The Rapid Advance in Design in the Machine Tool Field

In no other industrial field has the design of machinery used in production made such rapid strides as in the machine shop industry. The

machine tools used in production shops today are, in many instances, so radically different from those of twenty-five years ago that an outside observer, unfamiliar with their functions, would hardly recognize any similarity. This is true of no other great industrial field. While remarkable advances have been made in the design of textile machinery, the general appearance of the machines remains the same. Continuous rail mills and sheet mills have been designed which present a tremendous advance over past practice, yet the general principles of action remain the same. Even in the printing machinery field, with the great advance that has been made in high-speed presses and presses for color work, there is not the difference

between the presses of twenty-five years ago and today that there is, for example, between the automatic turning machines now used in the great automobile plants and the machines available for the same work a quarter of a century ago.

Back of All Our Industrial Advance is the Modern Machine Tool

We frequently marvel at the almost unbelievable advances that have been made in the design and performance of many kinds of equipment used in this modern day. We acclaim the feats of those who cross the continent, or even the ocean, in the number of hours that was required a century ago to travel from New York to Boston, but we seldom stop to consider that all this has been made possible by advances in the machine tools with which these transportation means are produced. We are surprised when we learn that there are several

Back of practically every product in our entire civilized existence today stands the machine tool. The paper on which this article is printed is produced by machinery made by machine tools. The textile machinery that weaves or knits delicate silk fabrics; the woodworking machinery that produces our furniture; the equipment of the thousands of plants engaged in the manufacture of food products; the engines and cars that haul these products to the market; the huge electrical machines that make possible the use of the hundred and one different electrical appliances in the factory, office, and home, and that make modern life convenient to a degree that would have seemed like a page out of a fairy tale only fifty years ago—all this machinery and equipment is produced by the aid of machine tools, the master tools of industry.

million more automobiles in the United States than there are telephones, but we often forget that it is the accuracy and the productive capacity of modern machine tools that have made it possible to produce automobiles at a price within the reach of almost everyone.

Apart from its industrial significance, this great advance has also been the basis for the improvement in our social conditions. It has raised the standard of living to a point that the boldest dreamers half a century back did not dare to imagine. It has placed within the reach of most people luxuries that could formerly be enjoyed by only a few. The industry that has played so active a part in changing conditions and that is able to hold out a promise for still greater and more remarkable changes in the future, may well look with pride and satisfaction upon what it has accomplished.

* * *

POSTING INFORMATION ABOUT PLANT ACCIDENTS

At a foremen's conference held by a Cincinnati group, the subject of the advisability of posting information on plant accidents on shop bulletin boards was discussed. The results of this conference showed the value of bringing up topics of this kind for discussion among the foremen, because many points are brought out that might otherwise have been overlooked; as one of those present expressed it, "This is a good way of solving shop problems by group brains."

In the case under consideration—the posting of information on plant accidents—the following advantages were brought out: (1) The information serves to caution other workers and may prevent further accidents;

(2) it acts as a warning to all employees; (3) it lists each department's accidents and stimulates the foremen and men to take the necessary precautions, as it is an appeal to the pride of both foremen and men to prevent accidents; (4) it is better to have facts than rumors or half truths circulated about accidents; (5) posted facts will prevent expanded stories of accidents; (6) the management will not be accused of concealing facts about accidents in the plant.

The objections raised to the posting of information on plant accidents were as follows: (1) There is a tendency to intimidate the worker and to magnify in his mind the hazards of the employment; (2) information of this kind is negative, rather than positive; (3) there is a possibility of the information being misused by unscrupulous lawyers in cases of damage suits.

RUST RESISTING TREATMENT

By ERNEST L. HOLCOMB

Sometimes it is found desirable to finish small parts used inside a machine, such as pawls, pins, stops, etc., by simply hardening and oiling, to save the expense of further finishing. According to the writer's experience, if the parts are quenched in oil and used without grinding the surfaces, a plain hardened and oiled finish will usually resist rust satisfactorily provided it is not subjected to handling. But when the surfaces have to be smoothed after hardening, tumbling (if it can be done) is preferable to wheel burnishing or grinding because of lower cost, and because it is more difficult for rust to get a foothold on a surface that has been hardened, tumbled smooth, and oiled.

A rust test showed parts that had been pack-hardened, tumbled, and oiled to be practically the equal of parts that had been hardened and oiled

without tumbling. The parts tested were placed in a 20 per cent salt spray vapor, and after many hours showed no rust, while other samples of the same parts, with the same hardening, but ground and oiled, showed considerable rust on the ground surfaces.

Small parts should preferably be tumbled in fine sand or pumice, and afterward smoothed or burnished in sawdust, leather scrap, or by balls. There are so many combinations of materials in use for tumbling that it is practically impossible to say without trial what should be used in any particular case. It is evident that the process should remove the scale, smooth the parts, dry them thoroughly, and oil them with a suitable film before atmospheric moisture can accumulate. If they are oiled

while warm and dry, so much the better; and, of course, it pays to use an oil that has a rust preventive action.

Parts that would be bent out of shape by ordinary tumbling methods may often be handled satisfactorily if enough abrasive (sand and soda water, etc.), or enough buffing material (sawdust, etc.), is used to keep the parts from locking together and striking too hard against each other or against the sides of the barrel during the tumbling operation.

* * *

INDEX TO MACHINERY

The index to the thirty-fifth volume of MACHINERY, covering the year September, 1928, to August, 1929, inclusive, is ready for distribution. MACHINERY's subscribers may obtain copies for their files upon request.

Applications of Portable Electric Tools

A Series of Illustrations from
Michigan Automobile Plants



Fig. 1. Drilling 1/8-inch Holes through Aluminum Strips on the Running Board with a High-frequency Electric Drill Weighing 6 1/2 Pounds



Fig. 2. Using an Electric Screwdriver for Driving 1/4- and 3/8-inch Hexagon Nuts in the Running Board Assembly



Fig. 3. Driving 1/8-inch Square Nuts in the Assembly of Running Board Molding to Running Board, by Using an Electric Screwdriver



Fig. 4. Assembling Running Boards to Running Board Brackets, Using an Electric Right-angle Nut Setter Having a Total Weight of 15 Pounds

Typical Examples in the Automobile Industry

Photographs by Courtesy of the
Independent Pneumatic Tool Co.

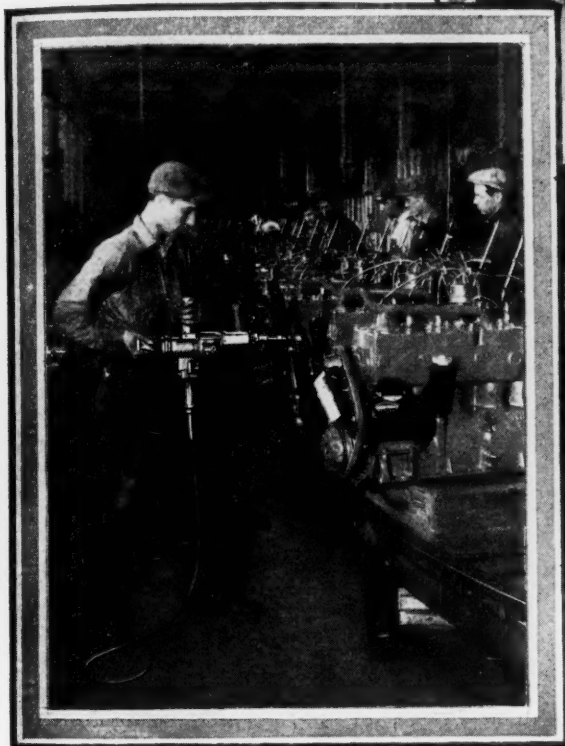


Fig. 5. Assembling the Fan to the Drive Shaft by Using an Electric Nut Setter for Driving 5/16-inch Cap-screws

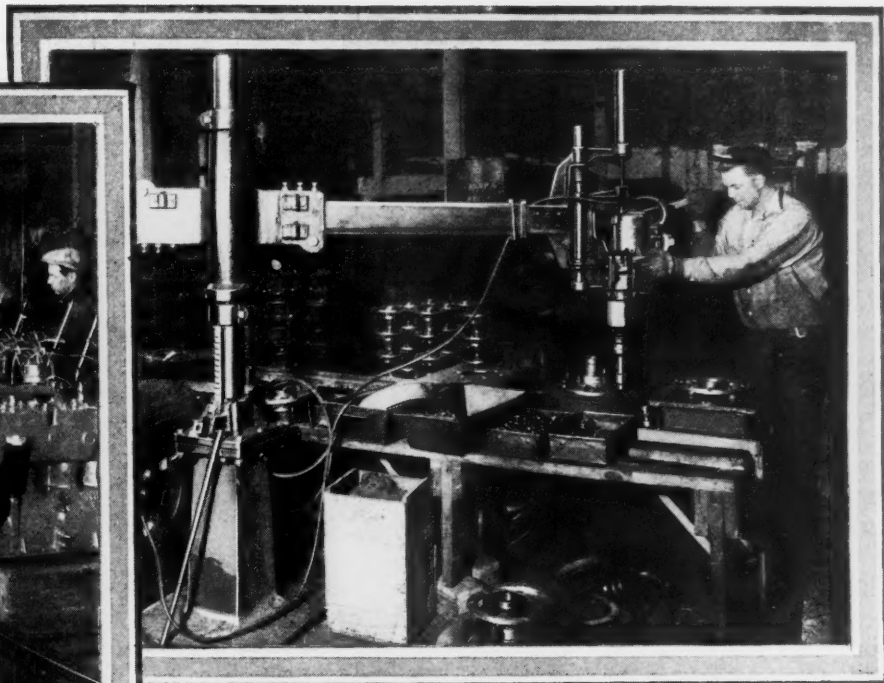


Fig. 6. Assembling Brake Drums, Using a Heavy-duty Electric Nut Setter with Gear-case and Bracket for Mounting it on a Supporting Stand

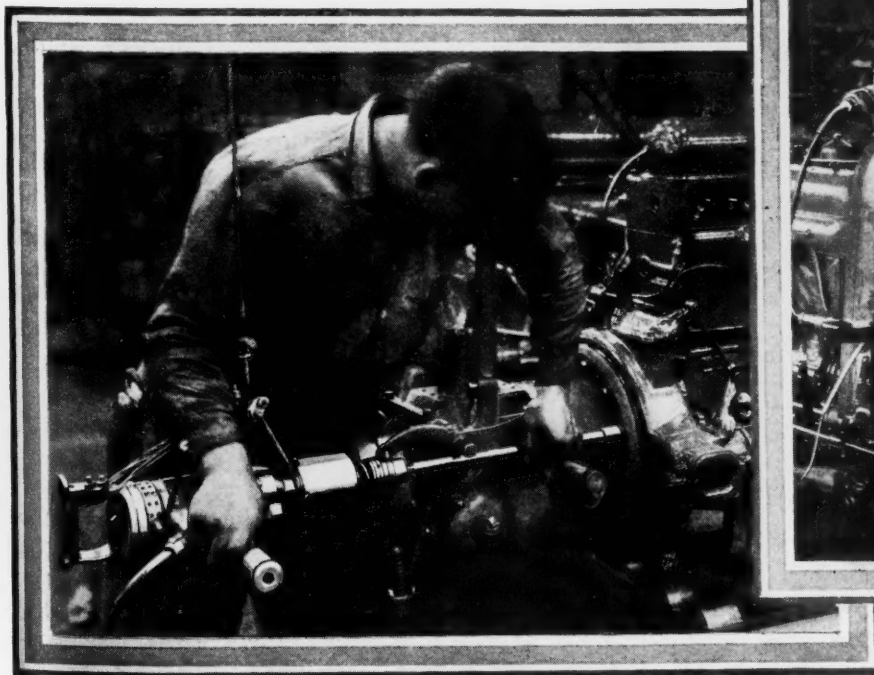


Fig. 7. Setting 3/8-inch Cap-screws in Bolting of Transmission Assembly to Motor, Using an Electric Nut Setter with a 24-inch Extension Shank

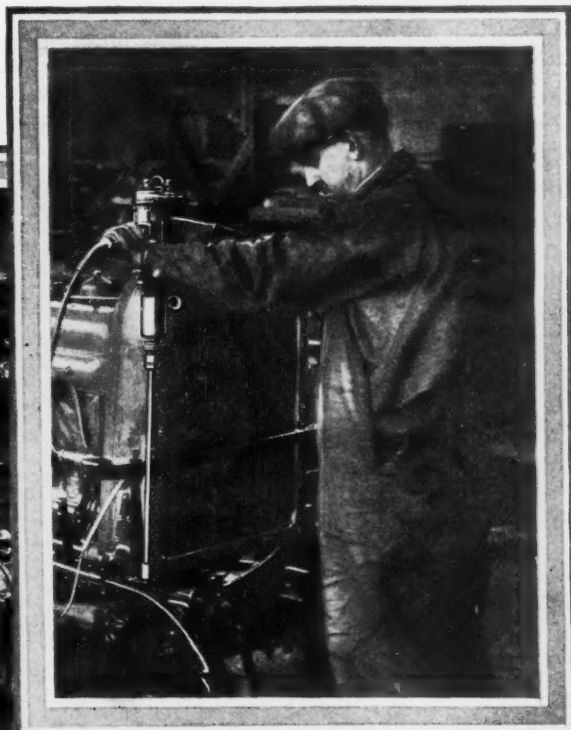
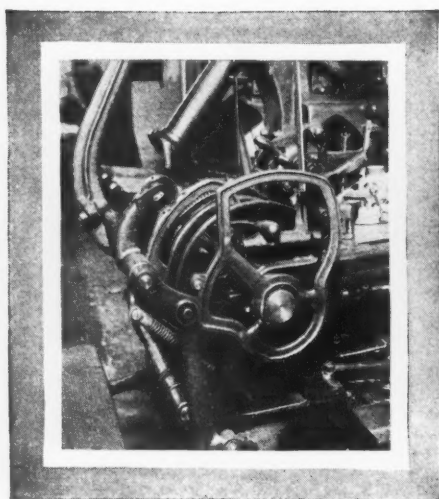
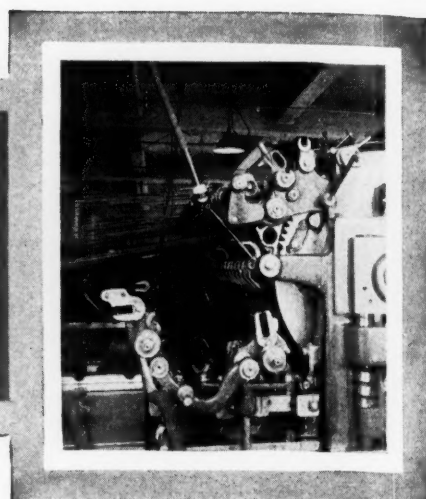


Fig. 8. Electric Nut Setter with 18-inch Extension Rod Used for Tightening Cap-screws Holding the Headlight Bracket to Frame



Ingenious Mechanical Movements



INTERMITTENT MOTION CONVERTED TO A CONSTANT DRIVE FOR SOUND PICTURES

All moving projectors are equipped with some sort of intermittent device to cause the film strip to dwell at every picture. This is necessary, as it can be readily understood that to run the film through the projector at a constant speed would result in a blur on the screen. With the advent of the "talkies," however, this motion had to be reconverted to a steady drive for the film strip while it passes through the sound-producing attachment, as otherwise the latter would not function correctly. This was done in one instance with the arrangement shown in the illustration.

The intermittent motion is transmitted to disk *A* through bevel gearing. This disk is equipped with two studs *B* which pass through elongated slots in the web of the flywheel *C* and are connected to two studs in the flywheel web by coil springs. The shaft *Z* is keyed to the flywheel. It is obvious that the intermittent motion transferred to disk *A* will be absorbed through the combination of the coil springs and the flywheel, resulting in a constant speed for the shaft *Z*, which is the drive for the sound-producing attachment.

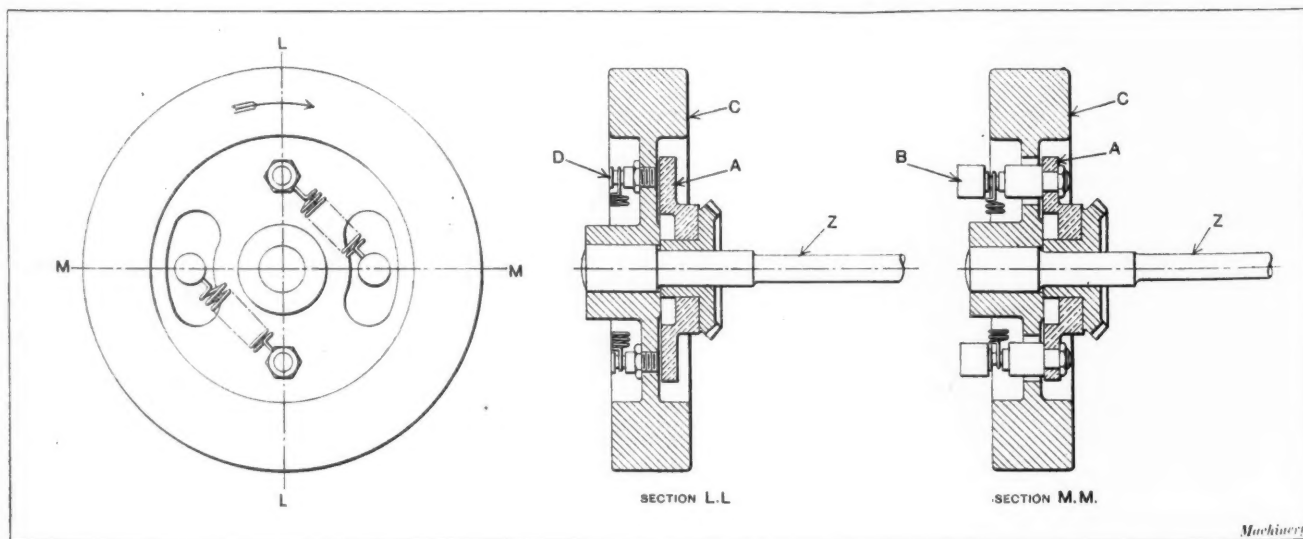
E. A.

HYDRAULIC RECIPROCATING MECHANISM FOR MACHINE TOOLS

The hydraulic control valve which is the subject of this article is designed for hydraulically operated grinders or other machine tools requiring a reciprocating motion. This valve, which is standard equipment on hydraulically operated grinders built by the Gardner Machine Co., Beloit, Wis., controls the flow of oil to and from the hydraulic cylinder that contains the piston or plunger for operating the work-table.

A one-way pump supplies oil at a constant pressure through pipe *A*, and the return flow is through pipe *B*. The work-table is operated by piston-rod *D*, and the flow of oil to and from cylinder *C* is regulated by control valve *E* in conjunction with pilot valve *F*. The illustration has been made partly diagrammatic to show the arrangement more clearly.

When valve *E* is in the position shown, the oil from the pump enters through port *G*, which is connected with pipe *A*, and passes through port *H*, forcing the piston to the right. Oil from pipe *A* passes through port *J* and through the hollow pilot valve *F* and port *K*, thus exerting pressure against



Device for Converting Intermittent Motion to a Constant Drive

valve *E* which causes it to shift to the left-hand position shown. The arrows indicate the direction of flow. During this movement of valve *E* to the left, oil which previously entered the left-hand end of the chamber containing valve *E* is exhausted through ports *L*, *M*, and the main exhaust port *N*, as indicated by the arrows.

Now when a stop on the reciprocating part engages collar *P* on the pilot valve rod and moves the pilot valve to the right, port *K* is opened to the exhaust ports *M* and *N*, and oil under pressure flowing through port *J* passes through port *L* and shifts the control valve *E* to its right-hand position. The main inlet port *G* and port *Q* are now connected, so that the piston begins its movement to the left, and oil in the left-hand end of the cylinder is exhausted through ports *R* and then to the right through the interior of valve *E* and out through ports now opposite the main exhaust port *N*. The pilot valve *F* requires a movement of only $\frac{3}{8}$ inch, and valve *E* is shifted quickly so that full port opening is obtained without delay and the flow of oil is not restricted.

D. R. HOLL

* * *

In the last two years \$300,000,000 has been spent on airports by one thousand communities in this country, and it is expected that an additional \$200,000,000 will be spent by one thousand more communities in the next twelve months. It is perhaps time to ask the question, "What percentage of return may be expected on these great investments?" If a community should invest in other transportation property, such as a street railroad line, the investment would be expected to pay dividends. Should not air transport investments be expected to pay actual dividends in dollars and cents in the same way?

HEAVIER FRAMES AND LIGHTER SPRINGS FOR AUTOMOBILES

There has been a great change in the weight of passenger car chassis during the last twelve years. According to an article in *Automotive Industries*, some parts now weigh 50 per cent more than they did in the 1917 models, while others weigh little more than half of what they then did. This does

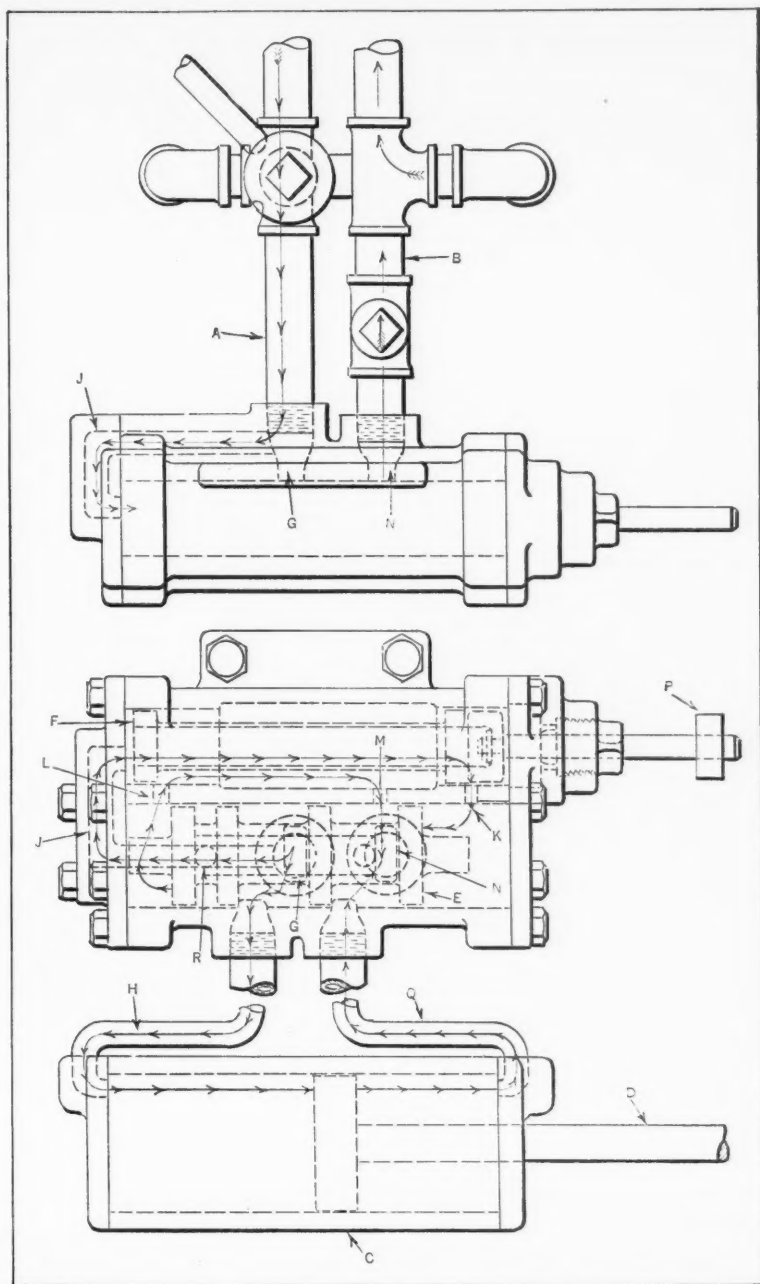
not mean that the earlier cars carried a great deal of excess weight or that the weight was incorrectly distributed. The changes have been brought about by changes in chassis design and, to some extent, by the use of materials of greater strength. The adoption of four-wheel brakes has added greatly to the weight of the front axle assembly, and closed bodies have also made it necessary to use frames of greater rigidity and weight.

Springs, on the other hand, are much lighter, and the weight of front and rear springs has decreased more than 25 per cent. The factors that have made possible the reduction in spring weight are not so easily determined, but a number of causes have combined to produce the result. Roads are much better today and there is less need for the springs to take care of extreme deflections. It is also possible that

the use of balloon tires with their greater permissible deflection has led to a reduction in spring weight. Finally, alloy steels are used for springs to a much larger extent than twelve years ago.

* * *

Of the 20,000 miles of airways now in operation, 9000 miles have been lighted by the Department of Commerce. An average of 42,000 miles is flown over these airways every twenty-four hours.



Hydraulically Operated Reciprocating Mechanism

What MACHINERY'S Readers Think

A Department for the Interchange of Ideas on Problems of Management, Foremanship, and Employee Relations

COST ESTIMATING SHOULD BE TAUGHT IN COLLEGES

Good machine designers and draftsmen are generally available who, if given sufficient time, are able to produce a good design in the strictly technical sense. Many of these men, however, do not realize the necessity for carefully analyzing their designs from the viewpoint of manufacturing costs. In the great majority of cases, this is really the fault of our educational institutions. There are very few technical schools and colleges that teach their students to consider the production cost when working out machine designs.

Every technical school and college should include a course in cost estimating. If the students are taught to analyze their designs from the viewpoint of the manufacturing cost, we will have more confident and efficient designers. J. GURWITCH

PREVENTING SPOILED WORK

While, of course, all work will be ultimately inspected according to the system employed in each plant, it should be a rule that the foreman in each department must check the work done, unless there is a special department inspector. The foreman is in a strategic position to catch all spoiled work before the damage has reached too great proportions, and he can remove the cause in the shortest time. If the operator is at fault, the foreman can take steps to correct the mistake immediately.

To make sure that all work going through his department is properly inspected either by himself or by a department inspector before being passed on to another department is one of the most important duties of a foreman, for if work that does not meet the requirements is turned out of the department, the foreman's efforts for quantity production and low cost are wasted. JOSEPH BELL

COULD TOOL STEELS BE STANDARDIZED?

The conditions referred to in the article, "Could Tool Steels Be Standardized?" on page 832 of July MACHINERY, are not satisfactory. Seven hundred different brands of tool steel are not necessary. To the customers, the brand names assume an unwarranted significance, while to the manufacturers they represent good will that cannot be lightly sacrificed. Immediate standardization, therefore, appears difficult, and while I believe that it is highly desirable, and ultimately possible, I would advocate a preliminary step, which can be carried out without upsetting the present system.

First, I would urge the tool steel manufacturers to cooperate in establishing among themselves cer-

tain grades for tool steels, under which all their products would be grouped according to their compositions and uses. The established grades should bear serial numbers, preferably high numbers, so that they cannot be confused with quality, which might be the case if grade 1, grade 2, etc., were chosen. The products would still be marketed under trade names, but in addition, they would bear the grade number, and all steels having the same grade number would serve the same purpose.

Gradually the user would begin to think and order in terms of the grade number, particularly when he discovered the advantages of this in securing competitive bids. Superfluous brands could then be withdrawn gradually from the market, until actual standardization is finally accomplished.

RUSSELL T. WALKER

BENCH DESIGNING IN AIRCRAFT SHOPS

Not only do I agree with the views on the value of bench designing expressed in the article on page 831 of July MACHINERY, but I do so as an engineer and draftsman. It may well be that engineers in our older industries object to this practice, but in the aircraft industry it is regarded as a highly acceptable procedure, and is used to a considerable degree at the initiative of the engineer.

This may be traced to the fact that such a relatively new industry as aviation is not steeped in tradition, but utilizes ability, experience, and initiative wherever it can be found. As most of its engineers, and more particularly its draftsmen, are young men, it is expedient to utilize the knowledge of the older men in the shops, who have had many more years of experience in their particular trades. The saving in time that is often so essential if a new model is not to become obsolete before it is produced is another factor that favors bench designing. This method often solves the problem of making changes quickly in existing aircraft.

It is often the procedure to supply the shop with dies and typical sections of a new float or flying boat hull, and then let the shop develop its own details from the mold loft lay-out. Interferences developed in the assembly of a new model, or changes found necessary or desirable in the construction of a plane, are recorded on project slips for use in the shop instead of being issued on finished drawings. These slips are either typewritten instructions or mere sketches, which the shop must actually work out under the general direction of the foreman and project engineer. Close cooperation is, of course, essential, but under its helpful influence, bench designing becomes a recognized and accepted procedure. JOHN F. HARDECKER

Special Tools and Devices for Railway Shops

Equipment Employed in Locomotive Repair Shops, Selected by Railway Shop Superintendents and Foremen as Good Examples of Labor-saving Devices

LOCOMOTIVE SHOE AND WEDGE FIXTURE

By J. H. HAHN

In Fig. 1 is shown a fixture used in machining locomotive driving-box shoes and wedges after they have been laid off in position to "square the engine." This fixture can be used on a planer, shaper, milling machine, or crank planer, and is designed to hold one piece at a time. The machining of a single piece has been found more economical than the "gang" method of machining several pieces at a time. This is due to the fact that the amount of metal removed from the faces of the driving-box shoes and wedges varies considerably, making it necessary to set up each piece according to the individual proof marks made in the "squaring" operation.

The particular fixture shown in Fig. 1 is designed to accommodate shoes and wedges for engines ranging from the small 2-6-2 type passenger engines to the 2-8-8-2 Mallet engines of the heaviest types. Fixtures of the same general design can be made to suit any type of shoes and wedges. The diagrams, Fig. 2, show a shoe *A* clamped in position for the machining operation. The same reference letters are used in designating like parts in Figs. 1 and 2.

The base of the fixture is located on the machine table by the tongue *B*. The work-holding member

C rests on cylindrical pieces *D*. Rivets *E* through the centers of pieces *D*, serve to secure member *C* to the base. The work is supported by the studs *F*, which can be adjusted by the hand-knobs *G* to bring the work into the required position. The studs *F* are threaded to fit bushings *H* pressed into the bottom of member *C*.

The conical pointed screws *I* which hold the work in place are inclined downward and toward the closed end of the fixture, so that their holding power is increased when the clamping plate *J* is forced against the end of the piece by the screw *K*.

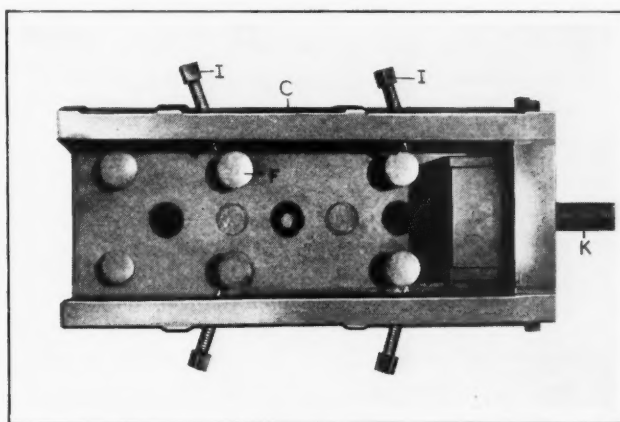


Fig. 1. Fixture Used in Machining Locomotive Shoes and Wedges

FACEPLATE JAWS FOR CHUCKING TIRES

By H. H. HENSON, Foreman, Machine and Erecting Shop, Southern Railway Co.

Four special jaws, one of which is shown in the illustration, are used for holding locomotive driving wheel tires to the faceplate of a heavy-duty wheel lathe. The body or base *A* of the jaw is a steel casting, and is bolted to the faceplate. The jaws are set central, so that the tire will rest on the hardened steel supports *B*. The tire is clamped securely by means of the dog *C*. This clamping action is obtained by the wedge *D* which passes through slot *E* and forces the other end of the dog upward. By using a centering gage, the inside of the tire is trued up with the aid of the set-screws *F*. The elongated slot in the base permits the dog to be

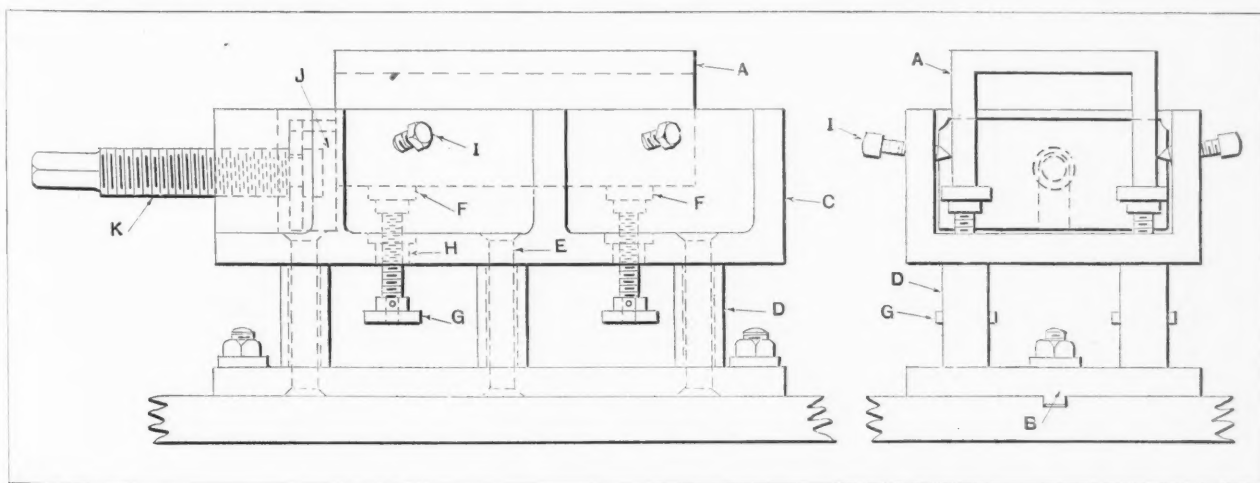
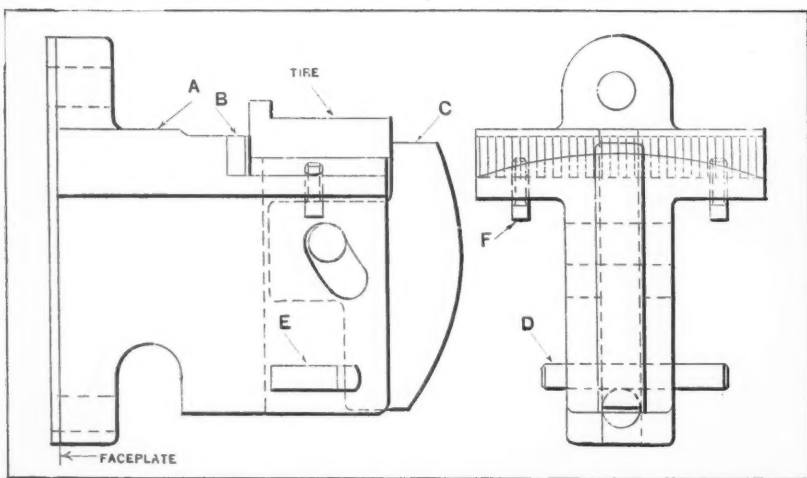


Fig. 2. Diagrammatic Views Illustrating Method of Holding Work in Fixture Shown in Fig. 1



Wedge-operated Clamp for Holding Locomotive Tires on Lathe Faceplate

moved back to clear the tire when it is being placed between the jaws or removed. This type of jaw can also be used on a tire turning boring mill.

SCHEDULE BOARDS INCREASE SHOP OUTPUT 25 TO 30 PER CENT

In several of the shops of the Southern Pacific Railroad, schedules for repair jobs are indicated on large blackboards placed in prominent positions. These boards show the progress of work in every department, and, owing to their prominence, they induce each section of the shop to make special efforts to keep up to the schedule in its work. The use of one of these boards in the Car Department of the Southern Pacific Railroad at Tucson, Ariz., is claimed to have increased the output of the department from 25 to 30 per cent.

The schedule board in use at Tucson is 8 feet high and 10 feet long. It is divided into six main sections, one for each department that handles rebuilding and heavy repairs. Each of these sections is divided into four columns, the first showing the time work should be completed in by the department; the second, date material was ordered; the third, date material was furnished; and the fourth, "Remarks," under which various colored tags are hung, denoting progress of work on car. A blue tag indicates that the work has been completed; red, that the work is being held for material; and yellow, that the work has been delayed from another section. Any unusual delays are shown in a pocket on the extreme right of the board.

When a heavy repair or "rebuild" comes in, the amount of time allowed each department is estimated. This figure is submitted to the general foreman for approval. Then the car number is shown on the schedule board, with the date due from each of the departments; the time due from the shop is shown under the caption "Due from Shop."

Take for example a car that arrived in the shop on June 2; the steel gang was given until June 4 to complete their work; the body gang until June 12; the roof gang until June 12; the truck gang until June 9; the airmen until June 9; and the

painters until June 16; the car being due from the shop on June 16.

The steel gang finished its work on schedule time, and a blue tag was hung under "Remarks" on this section. The body gang, however, was unable to obtain the necessary material for its work, so a red tag was hung under "Remarks" on this section. If the roof gang's date expires and it has not received the car, a yellow tag is shown on its section, signifying that the work is being held up by the section ahead. Thus a glance at the board will show the progress of each car and the reasons for delays. At times, owing to all the work being concentrated on rush

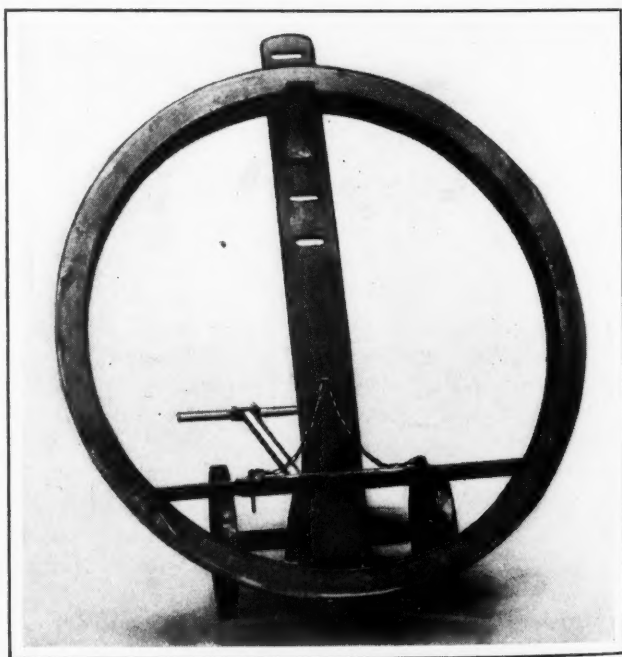
cars, the schedule on other cars suffers, but a notation is made to that effect on a card in the pocket to the right of the board.

The result has been that each department is "up on its toes" all the time and a friendly rivalry has sprung up between the departments. W. G. C.

TRUCK FOR HANDLING LOCOMOTIVE TIRES

By C. W. GEIGER

The Southern Pacific Co. has built a number of metal two-wheel trucks like the one shown in the illustration, by means of which one man can handle locomotive drive wheel tires. By merely raising the handle of the truck, the heavy tire is unloaded on the ground. The truck is made adjustable for tires of various sizes, by having six slots in the top of the flat piece of metal that supports the top of the tire. The special clamp on which the tire is held can be hooked into any one of the slots to suit the size of tire to be transported.

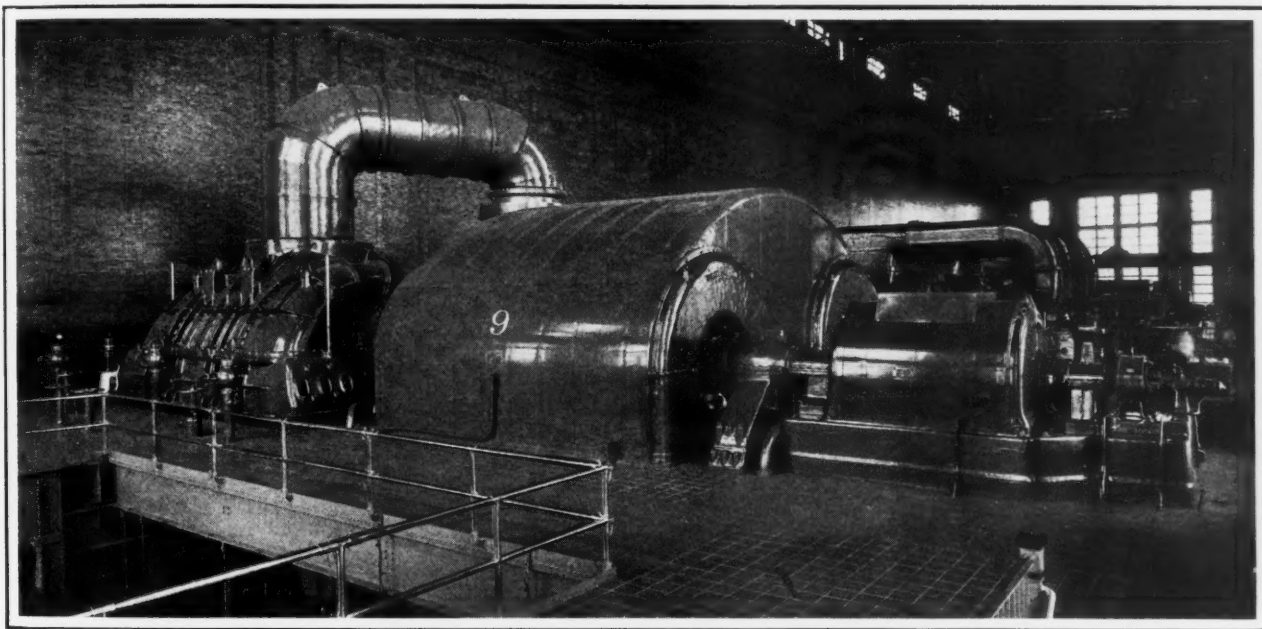


Hand Truck for Transporting Locomotive Tires

Notes and Comment on Engineering Topics

A Swiss locomotive works at Winterthur has built, for experimental purposes, a high-pressure locomotive with an average pressure of 700 pounds per square inch and a maximum boiler pressure of 850 pounds. The boiler works in conjunction with a high-speed uniflow engine and reduction gearing, the engine being designed to run at a speed up to 700 revolutions per minute. In normal running, an evaporation of 8000 pounds of steam per hour at a pressure of from 740 to 850 pounds per square inch was easily maintained. Thorough road tests

Steam Turbine Co. of Stockholm, Sweden, has been approached by an American airplane manufacturer, who has in mind the building of giant airplanes, with the request to prepare plans for a steam turbine to be used for aviation. The Ljungstrom concern is widely known for its steam turbines and turbine locomotives. The plans for airplane steam turbines are said to involve the use of a high-pressure boiler and a high-speed turbine developing, according to size, from 2000 to 10,000 horsepower. It is stated that to obtain a corre-



The Largest Generator of Electric Power in the World Today—A 165,000 K.W. Westinghouse Cross-Compound Turbine Generator Recently Placed in Service at the Hell Gate Electric Power Station in New York City

of the new locomotive indicate an average reduction of 35 to 40 per cent in fuel consumption, and only from 47 to 55 per cent of the previous water supply was needed.

In one steel mill, a solid mass of iron 8 feet high, weighing 65 tons which had frozen in a pouring ladle, was cut into smaller pieces by an oxy-acetylene blow-pipe and a so-called "oxygen lance." The blow-pipe was followed up by the "lance," which carried the cut down 8 feet to the bottom of the mass. The "lance" consisted of lengths of 1/8-inch and 1/4-inch steel pipe, connected to a source of oxygen.

At first thought one would think that steam turbines would not be suitable for airplane service, and, of course, it still remains to be seen whether they will be employed for that purpose in the future. It is reported, however, that the Ljungstrom

sponding amount of power from internal combustion engines would require so large a number of engines as to make the weight greater than that of the turbine plant. The reliability of a turbine power unit for long distance flights is also mentioned as one of its advantages.

The alloy steel known as "Nirosta" will be used to a large extent in the construction of the sixty-eight-story Chrysler Building now being built in New York City. This steel is used for decorative purposes. It has a color similar to platinum and is highly resistant to corrosion from exposure to atmospheric conditions, retaining its color and luster and showing no signs of tarnish. The steel has been used for decorative purposes on several buildings in Germany. The Central Alloy Steel Corporation, the Crucible Steel Company of America, and the Ludlum Steel Co. manufacture this type of steel in the United States.

Use of Concrete in Machine Construction

Methods of Applying Concrete to Machine Construction and Use of Templets to Obtain Alignment and Correct Location

By CHARLES B. IRMER

In the first article, on page 57 of September MACHINERY, was described and illustrated a machine in which concrete construction was incorporated as an integral part of the installation. The templets used to secure the proper location of machine parts on concrete members were also described. The present article deals with the types of fixtures and methods employed in completing the machine.

Cardboard Tubes for Coring Holes in Concrete

When the templets are all in place, the fixture shown in Fig. 7 is used for drilling the holes in the beam form to receive the cardboard tubes used as inserts for forming the holes for the oil-pipes of the lower bearings. This fixture is located directly from the templets previously set, and is so designed that no field measurements are required for establishing the position or elevation of the oil-pipe holes. The paper tube inserts are supported on wooden pins which pass through the sides of the bottom slab beam form.

The bottom slab is poured after all the templets, oil-pipe inserts, and reinforcing steel members are in place. As soon as conditions permit, the side wall forms are constructed and the walls poured. The bottom slab forms and the templets are removed at the end of the customary 28-day period, when the bolts holding the inserts and templets to the form are removed; the nuts remain in the inserts and act as tapped holes for the cap-screws used to secure the lower push-rod bearing to the bottom slab. The smooth surface of the templet makes those portions of the bottom slab in which the templets were placed during the pouring operation practically glass-smooth, thus permitting the joint between the slab and the lower bearing to be readily sealed with a relatively thin soft rubber gasket.

Aligning Supporting Beams for Shaft Bearings

The main supporting beams and the crankshaft bearing bases are lined up by the use of fixtures

like the one shown in Fig. 8. The hangers *A* are made of bent flat rolled steel and are suspended from the under side of the bottom slab from the holes cored for the push-rods. From these hangers the cross support channels *B* are suspended by the adjustable studs *C*. The beams *D* are secured in

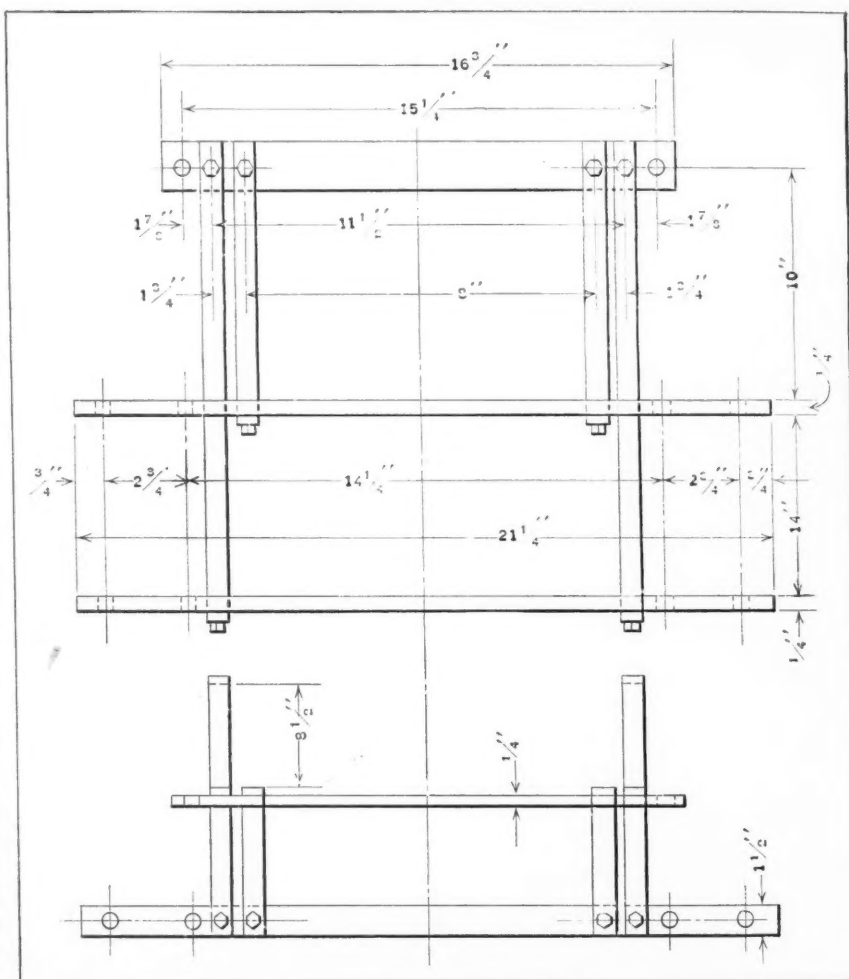


Fig. 7. Fixture for Locating Cores in Concrete Mold

the cage formed by the channel supports *B* and *E* and the through bolts, as indicated.

From the end of the channel support *E* are suspended adjustable studs *F* to which are secured the machined members *G* which hold the three crankshaft bases *O* in a common plane and at the correct longitudinal spacing. The center distance between the supporting beams *D* is fixed by the pipe spacers and through bolts *J*. The studs *C* are adjusted until the beams are parallel to and the proper distance from the under side of the tank, and central with the longitudinal center line of the tank, as

indicated by a plumb bob suspended from the piano wire.

The beams thus set, the crankshaft bearing bases are lined up by adjusting the length and position on the channel support *E* of the adjustable studs *F*, the final setting being such that the bases are at the proper elevation with respect to the supporting beams and the under side of the tank. Their common center line is also located parallel to, and the correct horizontal distance from, the vertical center line of the tank by measuring from the plumb bob.

The adjustable jacks *K* under the crankshaft bearing bases are then set up and the hold-down bolts securely tightened. These foundation bolts were, of course, placed in the floor before the floor

beams. Each of the machines, consisting of eighteen individual units, was positioned by the fixtures. The starting point for all the fixtures was taken as the cored and threaded insert holes in the bottom slab of the tank. The full details of the equipment used and the procedure in lining up and assembling the machinery will not be described here.

It may be of interest to show the design of the lower push-rod bearing applied to the under side of the concrete tank. When it is considered that the bearing is secured to the under side of the tank by a soft rubber gasket, it will be understood that the chance of perfect alignment being attained is rather remote. Thus the conventional design of rigid bearing was discarded and the type shown in Fig. 9 employed. The ball seat *A* allows the bearing to find its proper position after the push-rod is installed. When properly lined up, the bearing can be clamped in position by the nut *B* which forms the lower end of the ball seat.

Success of Methods Described

Installations have been made by the methods described in which all the concrete work was done by a local contractor; the setting of the templates was supervised by the machinery manufacturer, but the actual work was done by the contractor's workmen. The accuracy with which the parts were set by the methods described was such, in the case of one installation of four machines, that no shims whatever were required for lining up the crankshaft bearings, which consisted of twelve sets of three bearings each. These bearings were of the roller type, 2 15/16 inches in diameter by 6 inches long. All the oil-pipe holes through the beam of the bottom slab were so accurately located that no bending of the oil-pipes was necessary when they were connected with the tapped holes in the lower push-rod bearings.

Experience indicates that when designs are being made in which concrete enters as an integral part of the equipment in such a manner that it takes the operating strains of the machine, considerable care must be given to the design and installation of the equipment. If the parts must be accurately located, this requirement must be met by properly designing the holding devices which are employed for placing and securing the parts in place prior to the construction of the forms and the pouring of the concrete.

Makeshift fixtures or set-ups developed from scrap material are out of the question if accurate

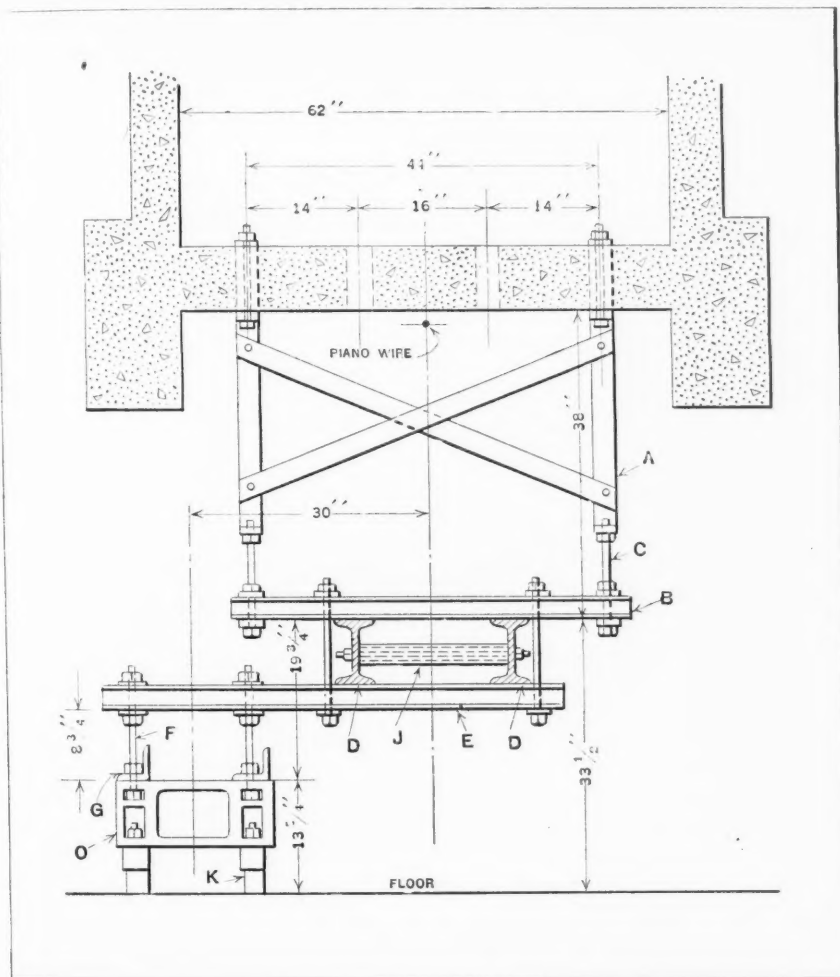


Fig. 8. Frame for Locating Cast-iron Bearing Bases

slab was poured. The supporting beams and the crankshaft bearing bases are thus rigidly secured in their correct positions within very close limits. The forms for the concrete foundation and connecting members are next constructed around the suspended structure, and the concrete poured, the supporting structure making it impossible for the parts to become dislocated while the forms are being built and the concrete poured.

Lining up Machinery on Supporting Base

Suitable fixtures were designed and made for use in lining up the machinery on the supporting

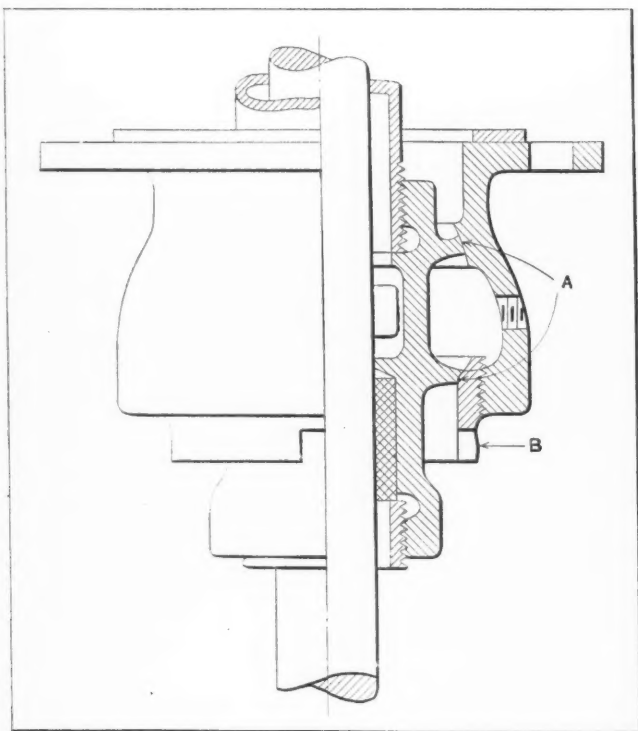


Fig. 9. Adjustable Lower Bearing for Scraper Push-rod

work is expected. The fixtures must prevent any relative shifting of the parts while the installation is being made by the rough and ready methods usually employed for concrete work. They must also be so designed that they will not interfere with the pouring of the concrete; otherwise, the concrete may not be properly tamped, resulting in porous and weak construction.

Finally, in summing up, the designer should always keep in mind the following factors:

1. First obtain a clear conception of the entire equipment to be produced and determine the required accuracy.

2. Be sufficiently familiar with the ways and means of conventional concrete construction to be able to design the fixtures and machinery so that they can be readily adapted to requirements.

3. In designing the machinery, employ duplicate parts wherever possible in order to reduce the number of different types of fixtures required.

4. Arrange, if possible, for the carrying out of any right- and left-hand construction with the same fixtures. This may necessitate designing the parts so that they will be positioned each side of some centrally located part of the equipment.

5. Make every attempt to produce a design in which the necessary set-ups, requiring the supervision of the manufacturer during the concrete construction work, can be carried out as a continuous program and thus minimize the number of field trips required of the manufacturing personnel. This is a very important point if the installation is at some distance from the engineering headquarters.

6. Have the conventional reinforcing steel so placed in the concrete structure that it will effectively

take any direct tension strains induced in the equipment during normal operation.

7. Have the necessary inserts for permanent incorporation in the concrete structure of such dimensions that, with the maximum size of aggregate specified for the concrete work, the insert will be securely embedded and afford the desired rigidity for the attachment of component parts of the assembled equipment.

* * *

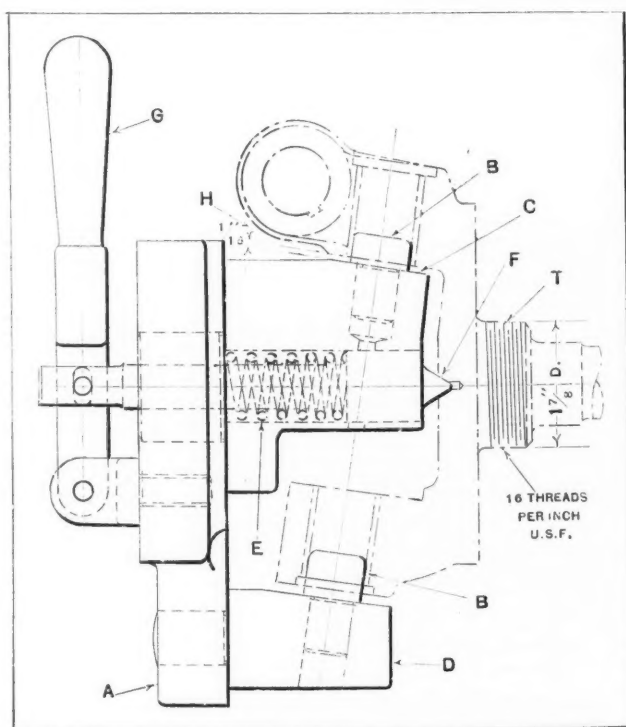
THREADING FIXTURE FOR AUTOMOBILE STEERING KNUCKLES

By HOLGER B. LARSEN

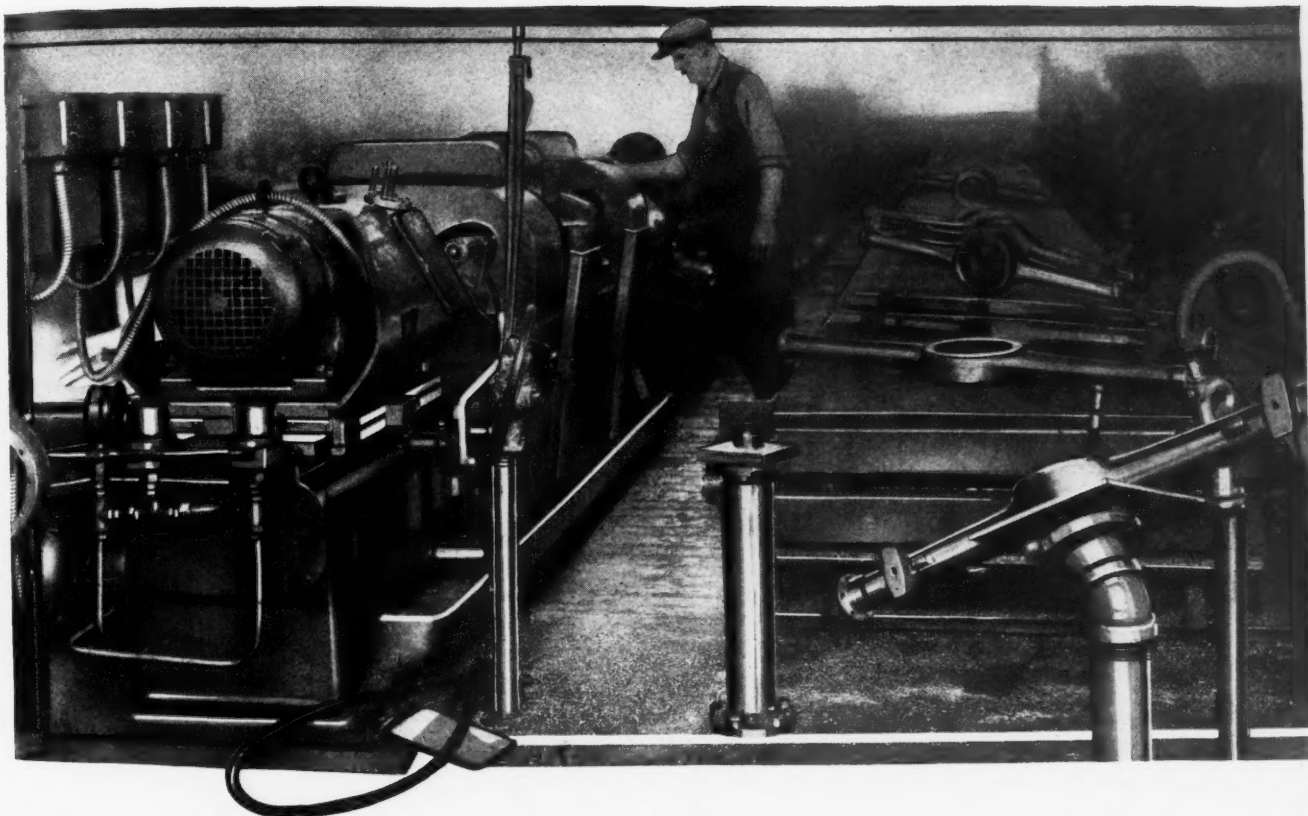
The fixture shown in the accompanying illustration is used on a two-spindle horizontal threading machine equipped with self-opening die-heads, for cutting the threads at *T* on automobile steering knuckles. The steering knuckles are made in right- and left-hand styles, one style having right-hand and the other having left-hand threads.

The body of the fixture *A* is fitted to the movable slide of the threading machine. In loading the fixture, the handle *G* is drawn back to the left a sufficient amount to permit the pin-holes in the steering knuckle to be located on the plugs *B*. On releasing lever *G*, the spring *E* forces the center *F* to the right into the machined center in the work. The work is thus properly centered for the threading operation.

The thrust exerted by the die-head is taken by the locating plugs *B*. The tension of spring *E* is sufficient to raise the work to the central position shown. The production rate of a machine equipped with fixtures like the one described is 175 pieces per hour.



Fixture for Holding Steering Knuckles while Threading



How Plymouth Axle Housings are Finished

Types of Machines and Tooling Equipment Employed for Machining Banjo-type Axle Housings in a Modern Automobile Plant

By CHARLES O. HERB

PRODUCTION executives visiting the new Plymouth plant of the Chrysler Corporation, Detroit, Mich., will find many methods of unusual interest. Conveyors are used in manufacturing departments, as well as in assembly lines, to reduce manual labor in handling the work to a minimum. The latest types of machine tools with up-to-date tooling, hydraulic feeds, and individual motor drives are employed to enable accurate work to be produced at low cost. Machine departments are laid out to provide a continuous flow of parts from a raw-material unloading platform on one side of the building to the various points where

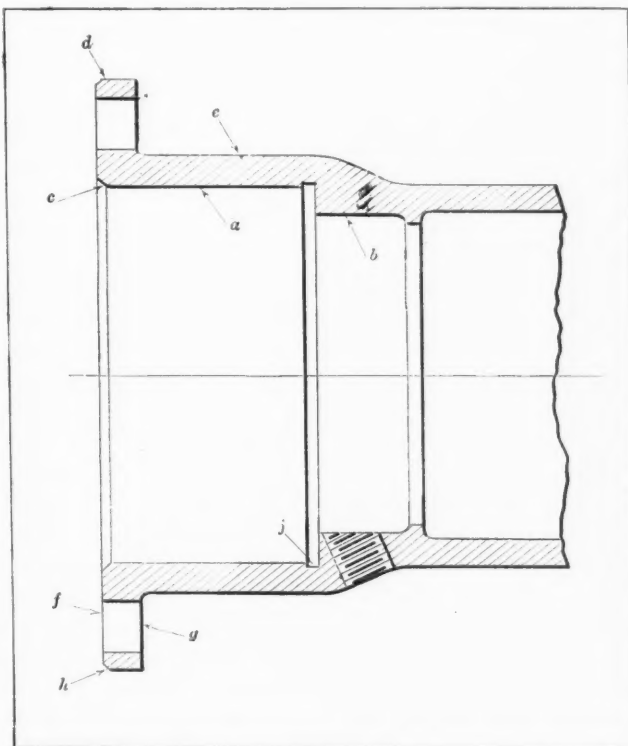


Fig. 1. Drawing Showing Construction of Each End of Plymouth Rear-axle Housings

the finished parts are required along two assembly lines running lengthwise of the building on the opposite side. The construction of the building itself is such as to permit all machines to be operated under natural light.

A general description of this new factory was published in the May number of *MACHINERY*, and an article describing features of the plating department, in the August number. This article will deal particularly with the more important machines and methods used in the rear-axle housing line. The machines of this group are arranged to give a production of 1000 housings per nine-hour day.

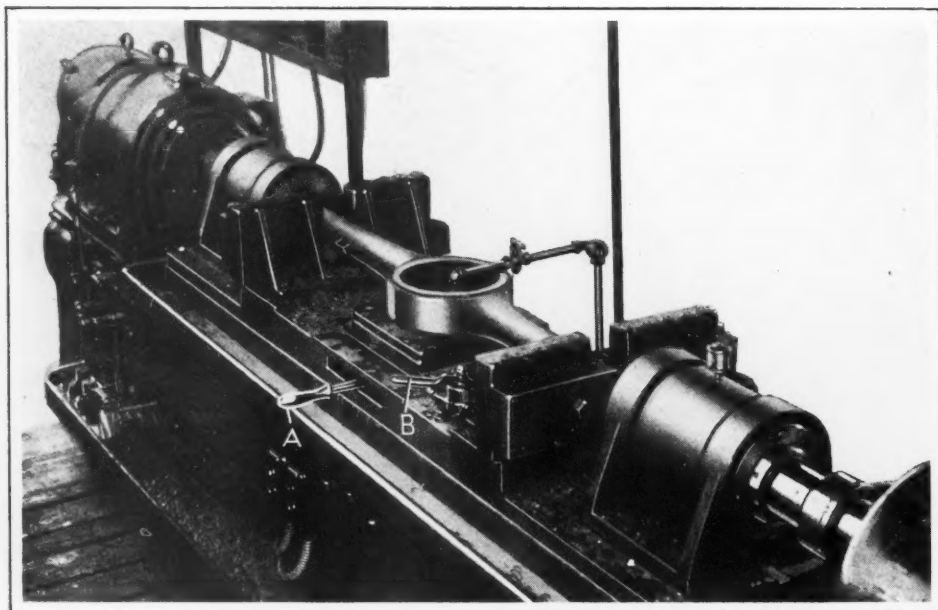


Fig. 2. Two-way Hydraulic-feed Machine Employed for Rough-boring the Housing Ends

Platform Conveyor Reduces Manual Labor and Increases Output

Machines of the rear-axle housing group are arranged on both sides of a platform conveyor, 4 feet wide, which extends the length of the department, as shown in the heading illustration. This conveyor moves at a speed of approximately 4 1/2 feet per minute. It reduces all manual labor to merely lifting the housings into and out of the machines. The housings are trucked from the unloading platform to the head of the conveyor, a distance of only about 40 feet. Horizontal types of machines are used for most of the operations on the rear axle housings, and in a great many cases, the machines are provided with hydraulic feeds.

hole by the movement of a lever, after plugs have been entered into the end holes of the housing to support the part.

Housing Located from One Banjo Hole in Most Machining Operations

The first machining operation on the housing consists of rough-boring roller-bearing seat *a*, Fig. 1, rough-boring surface *b*, and chamfering corner *c* at both ends of the part. In this operation, which is performed in the W. F. & John Barnes two-way machine shown in Fig. 2, the housing is located lengthwise from the banjo hole adjacent to the differential carrier face. This is done by means of three small eccentric studs, similar to those in the

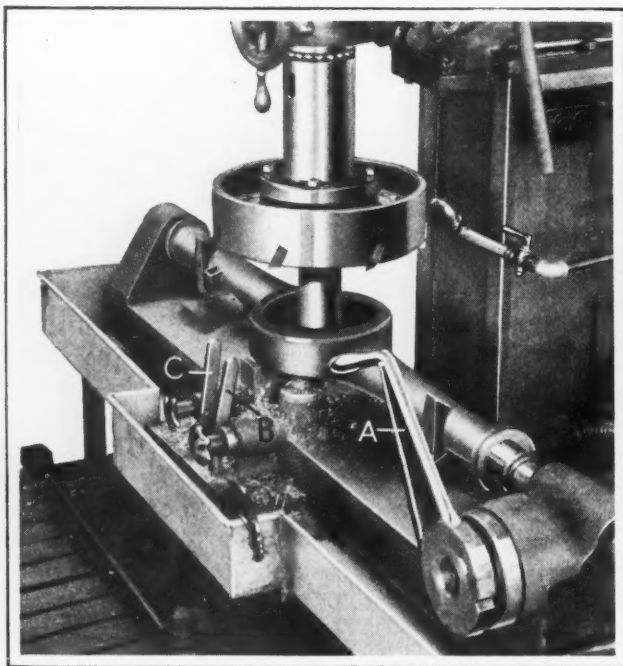


Fig. 3. Facing the Banjo Flanges on an Upright Drilling Machine

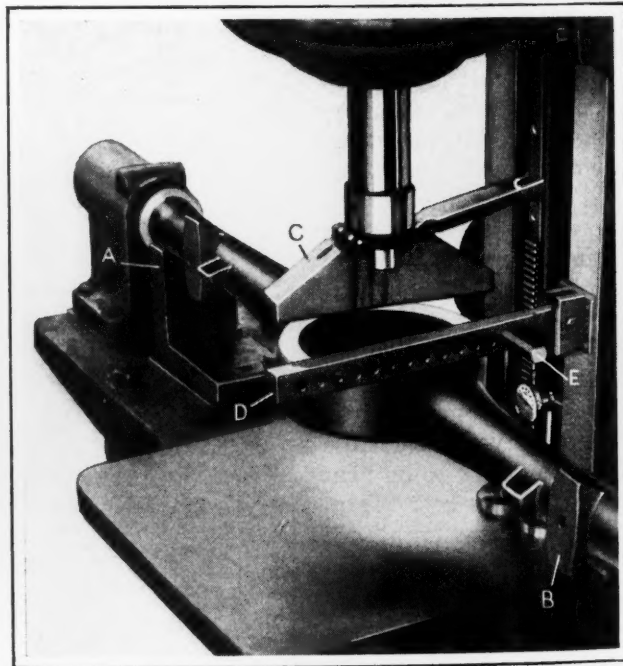


Fig. 4. Performing a Straightening Operation on the Rear Axle Housing

inspection fixture, which are engaged with the flange surrounding the banjo hole by operating lever A. This method accurately locates the housing relative to its center, and is employed in most of the operations on the part. Both ends of the housing are gripped by two-jaw air-operated clamps, actuated by a valve lever B.

The two heads of this machine are fed to and from the work simultaneously by means of a hydraulic mechanism which provides a rapid approach to the work, a slow feed during the cutting, and a quick return. Coolant is delivered to both cutters through passages running along their axes. Bore *a*, Fig. 1, is cut to a diameter of 2.653 inches in this operation, and bore *b* to a diameter of 2.280 inches, approximately 1/16 inch of stock being removed on each side of the bores.

Facing Both Sides of the Banjo Portion

The second operation on the rear-axle housings consists of machining both faces of the banjo portion. This is done on Baker vertical drilling machines equipped, as shown in Fig. 3, with cutter-heads about 15 inches in diameter, having seven inserted blades. For this operation, each housing is accurately located by plugs which enter the bores just machined. The left-hand plug is fixed, while the right-hand plug can be withdrawn from the work by handle A at the end of the operation.

The face opposite the one being machined is seated on four studs, three of which are equalized, the fourth being fixed. The equalized studs are raised against the bottom housing face by levers B and C, and are locked by the adjacent star-wheels. In the operation, the cutter-head is fed by hand to

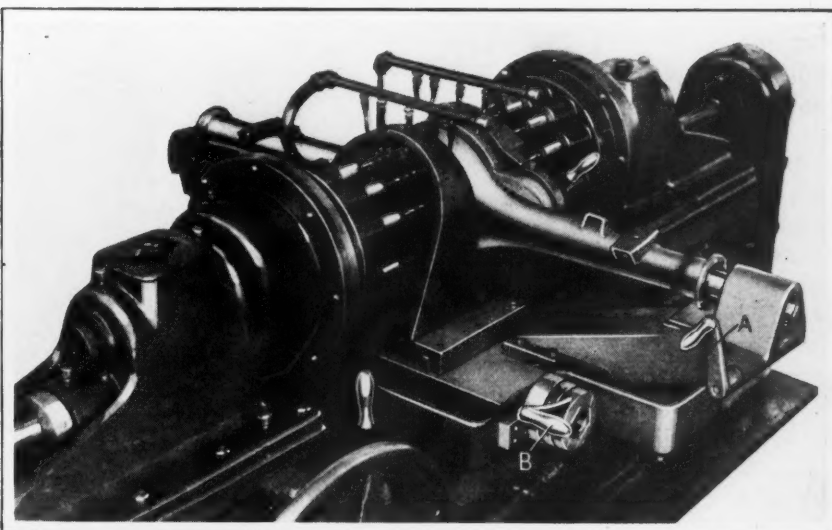


Fig. 5. Drilling Ten Holes Simultaneously in Both Faces of the Housing

a stop, the cutter speed being 18 revolutions per minute.

When one face has been finished, the housing is turned over in the fixture and the opposite face is machined. The distance between the two faces is held to between 3.365 and 3.375 inches, about 1/16 inch of stock being taken off each face.

Straightening of Housings Facilitated by a Simple Indicating Arrangement

Before any further machining operations, the housings are straightened with the equipment shown in Fig. 4, which was built by the General Mfg. Co. In this operation, the housings are supported at both ends on plugs that register with the chamfers *c*, Fig. 1, which were machined in the first operation. Again, the left-hand plug is fixed and the right-hand plug movable by operating a foot-treadle. When first placed in the fixture, the housing is clear of the V-brackets A and B, Fig. 4, but when the press ram is actuated and anvil C is

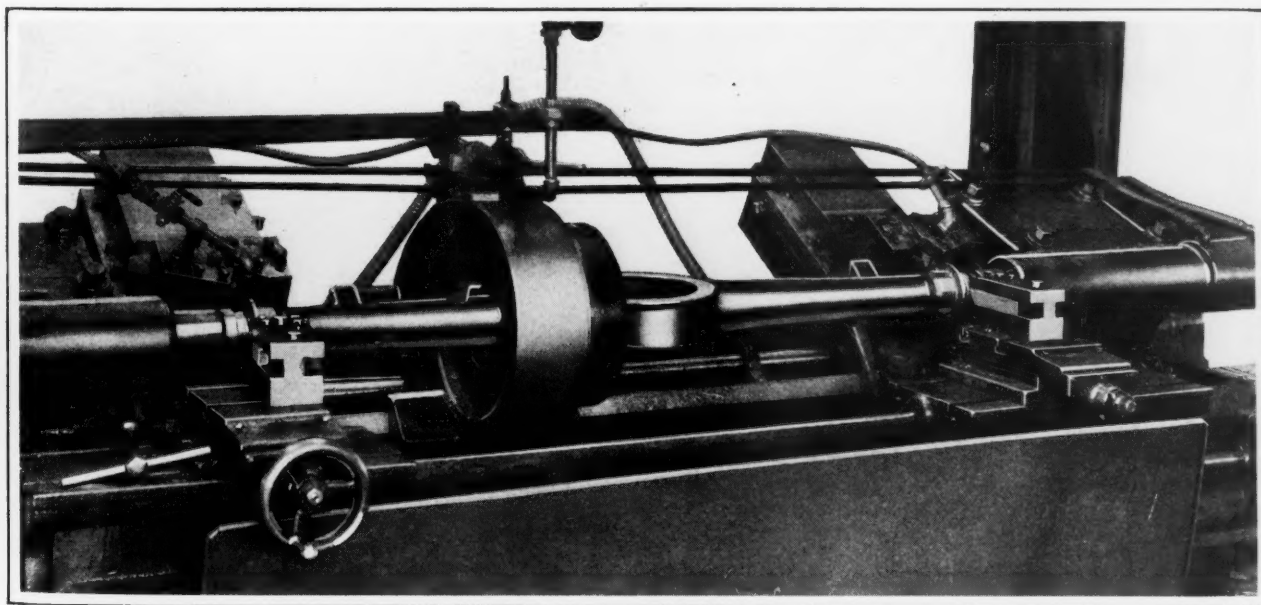


Fig. 6. Double-end Turning Lathe Used in Finishing Various Outside Surfaces of the Housing Ends

brought into contact with the work, both supporting plugs swivel and the pressure is taken by the V-brackets.

Before the ram is lowered, bar *D* is swung down on the differential carrier face and the spindle of a dial indicator is brought in contact with the under side of the flat-sided pin *E*, as shown. The indicator registers zero when

the differential carrier face of the housing is at the proper distance above a center line extending between the two end bores. This dimension is held to within plus or minus 0.004 inch.

Drilling Ten Holes in Both Banjo Faces Simultaneously

Ten holes, 0.332 inch in diameter, are drilled simultaneously in each banjo face on the W. F. & John Barnes two-way machine illustrated in Fig. 5, which is equipped with Krueger drill heads. For this operation, the ends of the housing are supported on brackets at the front and rear of the carriage. The front end is held on a plug that can be moved

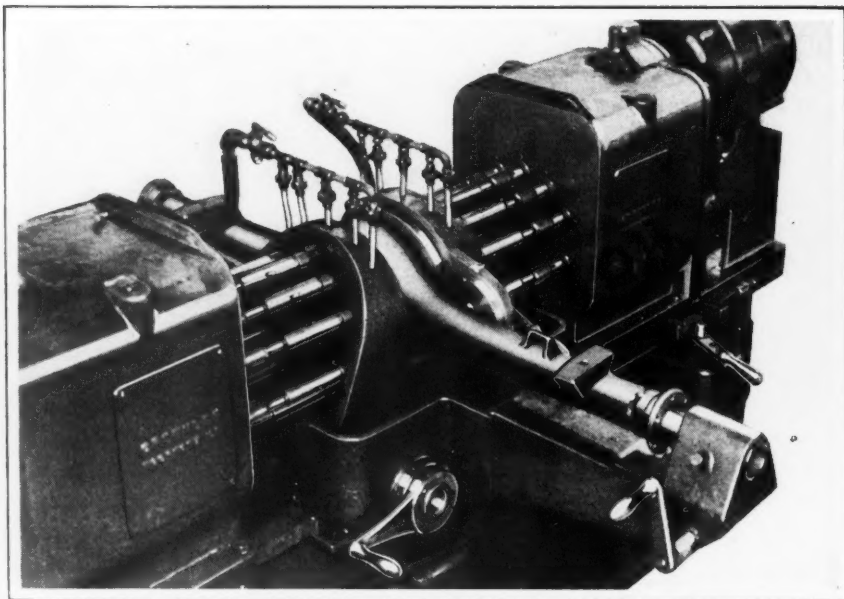


Fig. 7. Equipment Employed for Simultaneously Tapping All the Holes Drilled in the Operation Shown in Fig. 5

by handle *A*. The housing is accurately located by four cam buttons which are moved firmly against the edge of the one banjo hole and locked in position by turning handle *B*. The hydraulic feed with which this machine is equipped provides a rapid forward approach, slow feed, rapid return, and automatic stopping of the two heads.

Both Ends of Housing Turned at One Time in Center-drive Lathes

Sundstrand double-end lathes, equipped as illustrated in Fig. 6, are used for rough- and finish-turning periphery *d*, Fig. 1, of the end flanges, rough-turning surface *e*, facing surfaces *f* and *g*, and cutting chamfer *h*. The turning cuts are taken with tools held in the front carriages, and the facing and chamfering cuts with tools mounted on the slides at the back of the machines. The housings are located lengthwise in these machines by two dowel-pins of the center-drive chuck entering two holes previously drilled in one of the banjo faces.

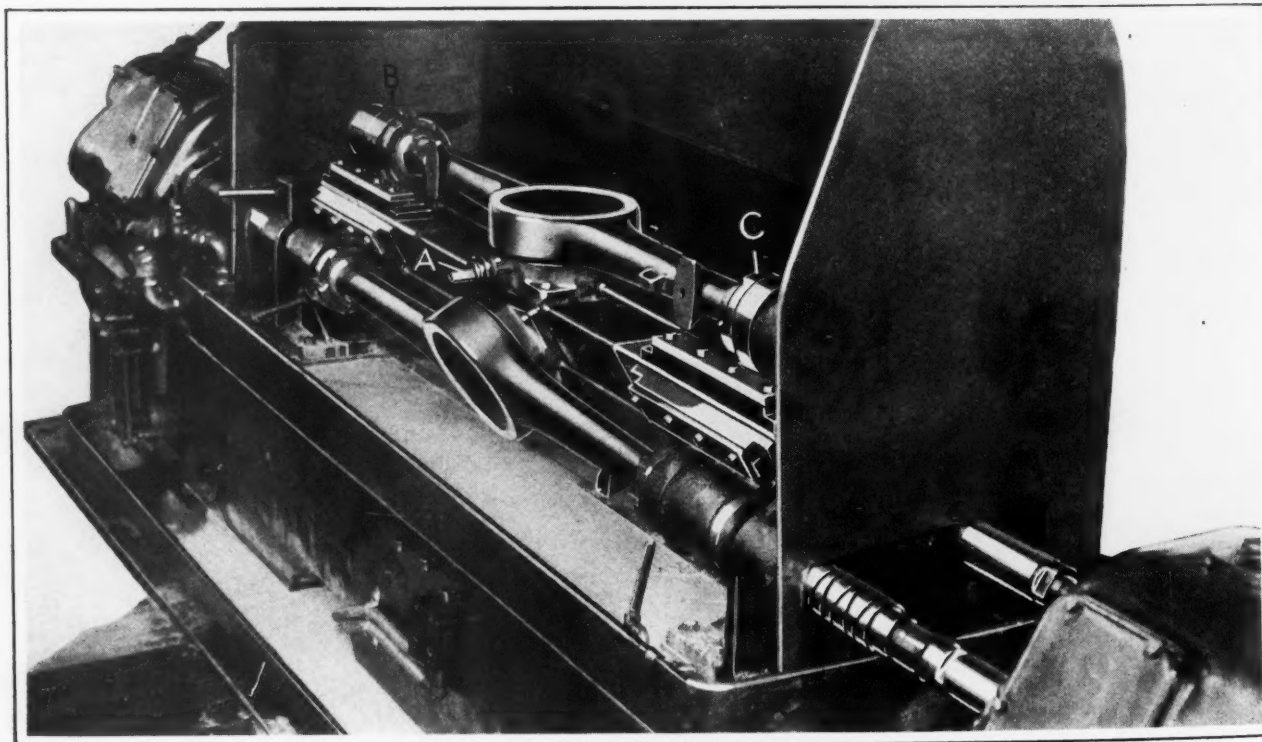


Fig. 8. Three-station Fixture in which Housings can be Loaded while Boring and Reaming Operations are in Progress

Air-operated live centers support the housing ends. A movable jaw of the center-drive chuck is tightened to grip the banjo portion against a fixed jaw for driving.

Tapping the Twenty Holes Previously Drilled

Tapping of the holes previously drilled in the banjo faces for the differential case and the differential case cover is done in Greenlee two-way machines, arranged as shown in Fig. 7. The work fixture of these machines is similar in principle to that illustrated in Fig. 5. Both heads of the tapping machine are driven by a lead-screw having the same lead as the taps; however, the taps have endwise float. A two-way switch provides for automatic reversal of the tapping heads when they have advanced the required amount. Cutting lubricant

responding screw. The movement of this screw also causes slides *B* and *C* to advance against the ends of the housing and clamp it in place. The boring cutters and reamers are piloted in bushings 8 inches long, attached to the work fixture, and also in bushings held in brackets fastened to the machine table. A copious supply of coolant is delivered to the cutters through the bushing adapters. Hydraulic mechanism is incorporated in this machine to actuate the heads.

Cutting Two Accurate Recesses at One Time

Recess *j*, Fig. 1, is cut in both ends of the housings at the same time by the use of Avey double-end machines equipped as illustrated in Fig. 9. The recesses are machined to a width of $\frac{3}{32}$ inch and a depth of 0.010 inch. An important feature of the

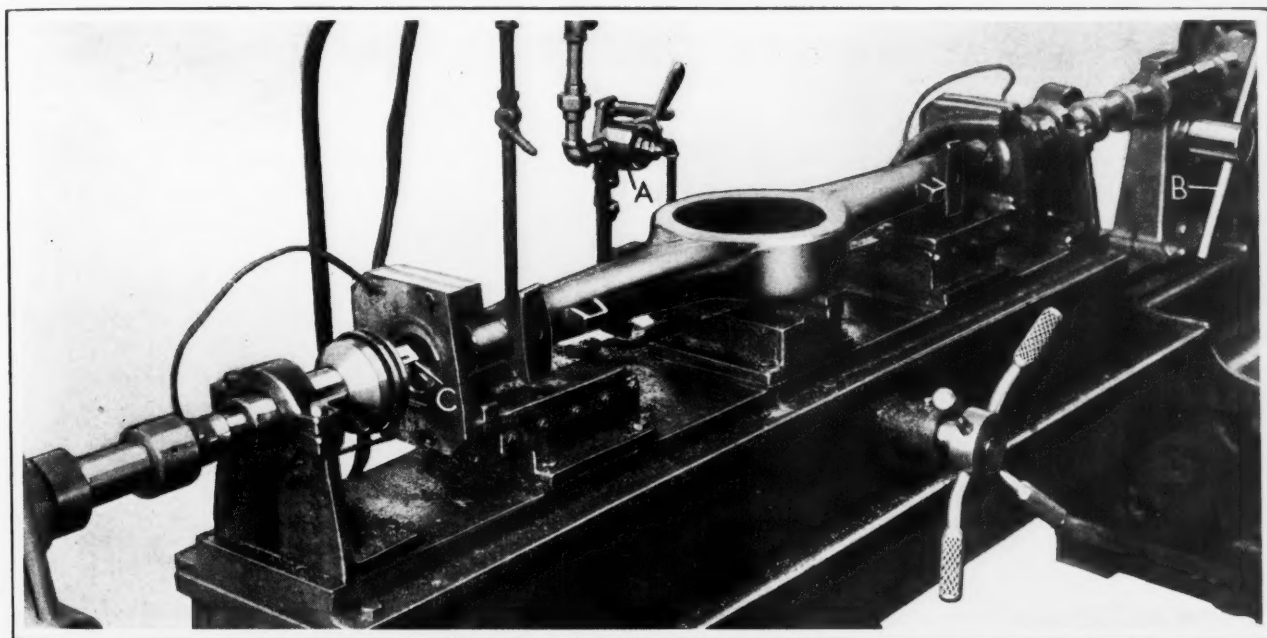


Fig. 9. Type of Machine Used for Cutting an Internal Recess in Both Ends of the Housing at the Same Time

is supplied copiously to each tap by an individual motor-driven pump in the base.

Three-station Fixture Expedites Boring and Reaming of the Housing Ends

Finish-boring of the roller-bearing seat *a*, Fig. 1, and of surface *b*, as well as reaming of seat *a*, are performed on both ends of the housings in W. F. & John Barnes two-way machines equipped with a three-station fixture, as shown in Fig. 8. This operation is practically continuous, as housings are reloaded on the top station of the fixture while one housing in the lower front position is being bored and another in the lower rear position is being reamed. Bores *a* are reamed to between 2.716 and 2.718 inches, and bores *b* are machined to between 2.310 and 2.313 inches.

For this operation, each housing is located from the previously turned end flanges, and one banjo face is seated on a block in which there are stop-pins that are raised in contact with this face when the crank is applied to the square end *A* of the cor-

operation is that the farthest shoulder of this recess is held to between 1.572 and 1.576 inches from the face of the end flanges. The housing is located from chamfers *h*, Fig. 1, by two air-operated slides which are drawn against the flanges through the operation of valve *A*, Fig. 9. One finished banjo face rests on a hardened block that is cleaned by compressed air after each operation.

After a housing has been loaded, a stanchion handle *B* on each headstock is turned, simultaneously feeding both tool-holders into the opposite ends of the work. One of these tool-holders may be seen at *C*. The tool-holders advance until stops mounted on the same spindles come in contact with the ends of the housing. Then, as the operator continues to turn the headstock handle, the tools in both holders are fed radially outward at an angle to cut the recesses.

Drilling and Reaming the End Flange Holes

Six holes are drilled in both end flanges and reamed to between 0.3745 and 0.3755 inch in one

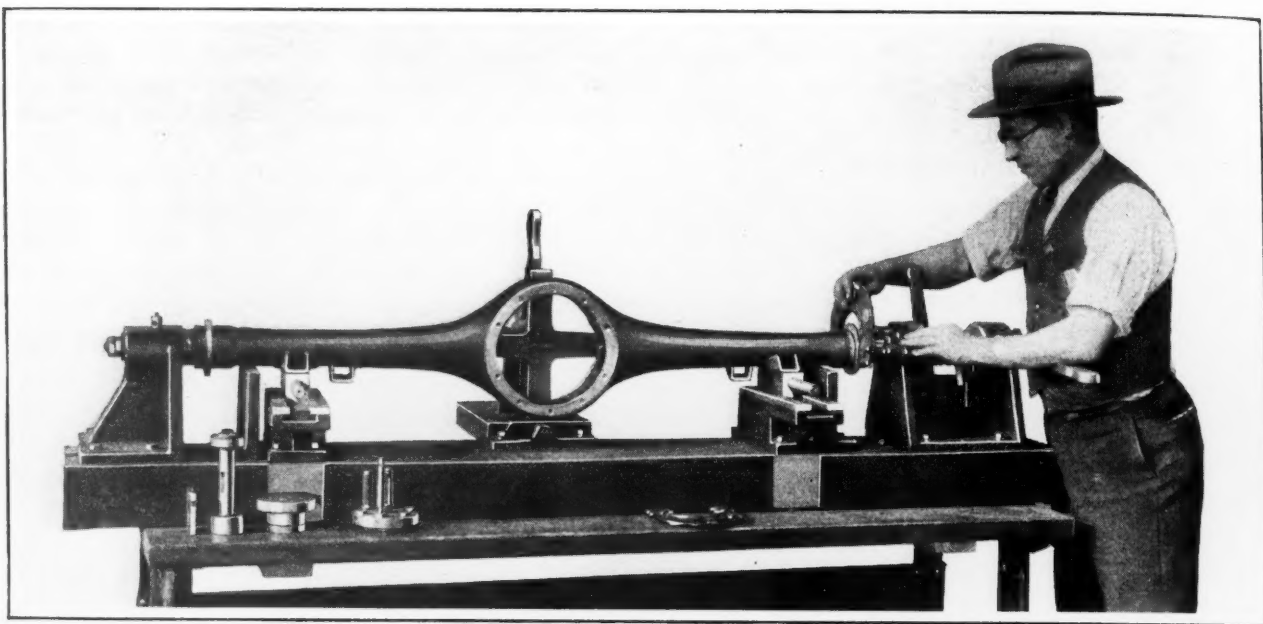


Fig. 10. Fixture which Facilitates the Careful Inspection Given Each Axle Housing at the End of All Operations

operation, in W. F. & John Barnes two-way hydraulic machines situated at the near end of the conveyor as seen in the heading illustration. These machines are provided with three-station fixtures similar to that shown in Fig. 8, and with four Krueger six-spindle heads. The drilling is done while the housing is in the lower forward indexed position of the fixture, and the reaming, when the housing is in the lower rear position.

Various minor operations performed on single-spindle drilling machines, which occur during the travel of the housings along the machine line, have not been described. As the housings are lifted from the end of the conveyor they are placed on stands, seen in the foreground of the heading illustration, and other minor operations are performed by the use of portable air tools. Then the housings are run through a Niagara washing machine and thoroughly cleansed from oil and dirt.

One Hundred Per Cent Final Inspection

From the washing machine, each housing is delivered to an inspector for careful checking by means of the fixture and gages shown in Fig. 10. The housings are located by plugs that enter the end bores. After being positioned, a spider mounted on a slide at the back of the fixture in the center is pulled forward, bringing four spring plungers in contact with the finished differential carrier face for checking the height from the longitudinal center line of the housing to this face. A plug on the spider is then slipped into a hole in the housing face to locate the housing lengthwise preliminary to checking the distances from the center of the banjo portion to the housing ends.

Other steps in the inspection consist of checking the height of the spring pads from the center line of the housing; the diameter of the end flanges; the concentricity of these flanges; the spacing of the holes in the flanges; the accuracy of the end

bores with respect to diameter and depth; and the spacing of the holes in the banjo faces. All these detailed inspections, six in number, are performed on every housing.

On each housing end, the exact depth of the roller-bearing seat is marked in thousandths of an inch. Later, in assembling the Timken bearings, shims 0.005 inch thick are used to position them, in accordance with the depth to which each seat is finished. This method insures that the bearing will have the predetermined amount of end play.

* * *

WELDING THIN ALUMINUM SHEETS

The importance of aluminum and other light alloys is increasing. According to Peter P. Alexander, of the General Electric Co., it is almost impossible to weld these alloys with the direct electric arc. However, they can be welded with gas. On account of their very low melting point, when the arc is established between the electrode and the plate, much of the metal is vaporized, but with the indirect arc, the temperature can be easily kept within the desired limits.

Hydrogen may be used in welding aluminum alloys as a protection against oxidation, the greatest obstacle to welding aluminum being the formation of aluminum oxide, which prevents the metal surfaces from running together. With atomic hydrogen welding, it is possible to weld aluminum under certain conditions without the formation of aluminum oxide, and it is even possible to reduce the aluminum oxide already formed to its metallic state. Still, it is not practical at present to use the atomic hydrogen welding process for welding thin aluminum sheets without fluxes, due to the fact that a high speed cannot be maintained in welding these thin materials. In practical applications of the torch for welding thin aluminum sheets, therefore, fluxes are used.

Planning and Tooling Up for New Work

A System of Routing Work that is Applicable to Both Large and Small Shops

By SVEND J. HELWEG

WITH a view to eliminating production delays, due to the omission of the smaller details when beginning the manufacture of a new product, the writer has outlined, in the following, a system which should facilitate the smooth routing of the work. The system may be used to advantage in either large or small plants.

When the management has approved of the model, it issues orders to the engineering department to proceed with the work, which progresses as shown by the chart Fig. 1. The designing department checks the original lay-outs with the model and has detail drawings made, on which are given part numbers, quantity wanted, size, and material used, as well as complete information regarding finish, hardening, etc. A part list, similar to that shown in Fig. 2, is then made out, giving the specifications for each part, except punchings, for which data is later inserted by the planning department after the dies have been designed.

The first step of the planning department is to call a conference of the production superintendent, purchasing agent, chief tool designer, and foremen of the pattern and foundry divisions. Each individual part is then studied carefully to determine which ones are to be purchased. The conference

also decides what patterns and tools should be designed and the type of machine required for manufacturing each part. The planning department then makes out operation sheets, Fig. 3, hardening and finishing cards, Fig. 4, and also issues purchase requisitions for parts, special tools, and machines to be ordered outside. The operation sheets specify the tools, gages, and machines used, and the departments through which the work is routed.

The hardening card, reproduced in Fig. 4, is made out for a cold-rolled steel piece to be cyanide-hardened all over in an oven at 1450 degrees and quenched in water. Next, orders are issued for designing and building all tools, production patterns, etc. Finally, when all the equipment is complete, and sample articles have been approved by the engineering department, orders are issued to the various production divisions to go ahead with the regular manufacturing. Thereafter all the responsibility for the progress of the work lies with the production superintendent.

Tool designing, the ordering of tool castings, and the building of the tools is done by the tool department. The foundry supplies the tool-room with sample castings, so that all drill jigs and fixtures can be tried out properly. These sample castings,

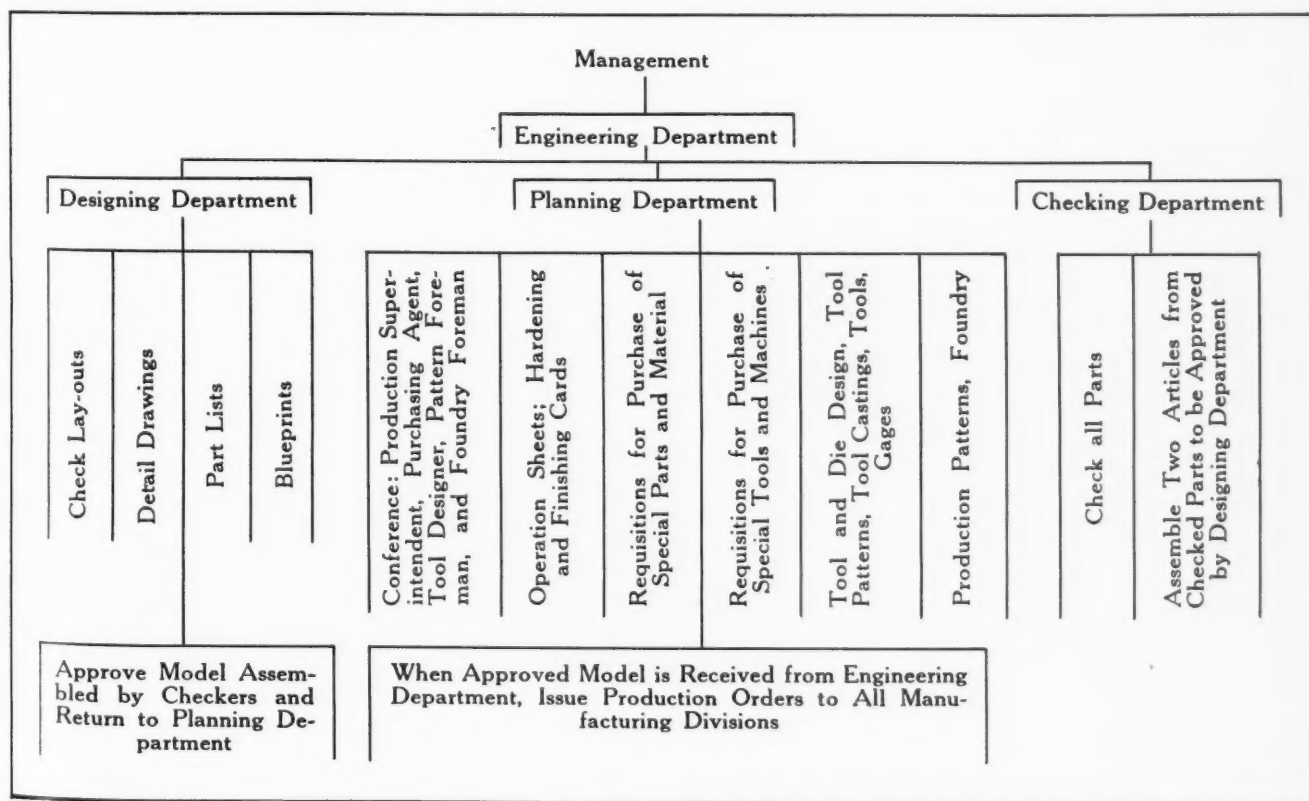


Fig. 1. Chart Showing Preliminary Routine before Regular Production on a Part is Started

CATALOGUE NO. 1921 NAME OF ARTICLE: <i>Ash Tray</i> DATE <i>3-17-28</i>										
DRAWING SIZE	PART NO.	QUANTITY REQUIRED	MATERIAL				NAME OF PART		FINISH	
			SIZE	MATERIAL	QUAL.	WIDTH				LENGTH Per Piece
D	135	1		Cast Iron				Base	new	green enamel
C	136	1	1/32"	Green felt (purchase to sample)				Base Felt	new	
E	137	1	.025	Brass	1/2 hard	1 1/2"	3"	Match Box Clip	new	polish
E	22	1						Match Box Clip Rivet	stock	
E	138	2	.030	Brass	hard	1 1/4"	7/8"	Cigar Holders	new	polish
E	139	2	.100 dia.	Brass wire	soft		1/4"	Cigar Holder Rivets	new	polish
E	140	1	1/16"	Rd. Edge Brass	1/2 hard	1/2"	10"	Bracket	new	polish
		2	3/8" x 6-32	Rd. Hd. Brass				Bracket Screw	stock	
Note: - Felt should be cemented to underside of base										

Fig. 2. Part List Form Containing Specifications of the Parts Composing the Article

after being machined, are turned over to the checking department. The duty of this department is to inspect samples of purchased parts and all parts as they are received from the tools. Then two of the articles to be manufactured are assembled complete. If they do not assemble properly, they are returned to the tool-room so that the tools may be corrected. In assembling the parts, it should be a rule that no fitting be done by the checkers. The assembled parts are finally approved by the designing department, after which the manufacturing divisions may issue orders for regular stock parts.

It should be noted that all records are numbered with the part number as a basic number. If the part number is 100, for instance, the part drawing number will be 100A, the letter A indicating the drawing size. The first tool designed for this part would be numbered T1-100, the drawing for this tool T1-100-B1, and the tool pattern T1-100-P1. Here T1-B1 signifies the first B size drawing, and T1-P1 the first tool pattern used for this tool. All production patterns for part number 100 are marked 100-PB or 100-PC, the letter B specifying brass and the C cast iron. By using the part num-

PART NO. 237 NAME <i>Operating Arm</i> DATE <i>2-19-28</i>									
Dept.	No.	Operation Name	Machine		Tools		Gauges		Remarks
			No.	Name	A.M.	Name	A.M.	Name	
6	1	Blank	357	Power Press	T1-237	Punch & Die			
9	2	Tumble	52	Barrel					
	3	Inspect						T2-237 Snap	
3	4	A-drill & tap screw hole	128	Drill press				T4-237 Plug	
		B-drill &ream center hole							
		C-drill pin hole							
4	5	Mill	233	Hand miller	T5-237	Fixture	T2-100 Snap		use std. 1/2" x 3" side mill
4	6	Burr							
	7	Inspect							
	8	Harden							see record card
	9	Nickel plate							see record card
	10	Inspect							
	11	Stock							

Signed *A. Williams*

Fig. 3. Operation Sheet for Routing the Work on a Production Basis

HARDENING ROOM RECORD.			
NAME OF PART <u>Pinion stud</u>		PART NO. <u>487</u>	
MATERIAL <input checked="" type="checkbox"/> C. R. S. <input checked="" type="checkbox"/> M. S. <input type="checkbox"/> Tool Steel <input type="checkbox"/> Drill Rod	QUENCH IN Oil <input type="checkbox"/> Water <input checked="" type="checkbox"/> Salt-Petre <input type="checkbox"/>		
CARBONIZING <input checked="" type="checkbox"/> Cyanide <input type="checkbox"/> Bone-Dust New <input type="checkbox"/> Bone-Dust Old <input type="checkbox"/> Bone-Dust Mixed Open Flame <input type="checkbox"/>	HARDEN <input checked="" type="checkbox"/> All over <input type="checkbox"/> Specified Parts		
IN FURNACE <input checked="" type="checkbox"/> Time <u>hrs. 30</u> Min. <u>0</u> Temp. <u>1450</u> °	TEMPER. <input type="checkbox"/> Color <u> </u> Oil <u> </u> °		
Remarks: <u>Use basket for holding parts</u> <u>Oil parts after hardening</u>			
Date <u>3/10/1927</u>		Signed <u>J. Jones</u>	

Fig. 4. Form which Gives all Information Necessary for Hardening and Finishing

bers as a base for all the other numbers, it is obvious that any tool or pattern can be quickly identified. The same numbers should be used throughout the factory and office, thus eliminating many of the cross-indexes that are now in general use.

A description of all the various record cards used is unnecessary, as they are often governed by the kind of manufacturing and the size of the organization. However, the important ones, which are shown, are at present being used by several large manufacturing plants, and can be modified to conform to the articles manufactured.

* * *

THICKNESS GAGE FOR SMALL PARTS

By SVEND J. HELWEG

A gage that is particularly adapted for gaging the thickness of small parts is shown in the accompanying illustration. This gage is small and can be operated very rapidly. A commercial dial indicator *A* is mounted on a vertical slide which is raised and lowered by a rack and pinion operated by hand-knob *D*. In gaging a part, the indicator slide is raised, the part placed on the anvil *B*, and the slide lowered until it rests on the two stop-pins *C*. The dial reading is then taken with the slide in this position.

By means of interchangeable anvils, parts of different heights or shapes can be readily accommodated. Large work can be gaged by mounting the slide on a suitably designed pedestal or column above the gaging fixture. When this is done, it is advisable to have the slide held in the upper position by means of springs and provide a foot-treadle for bringing the indicator down into contact with the

points to be gaged, so that the operator's hands are left free to handle the work.

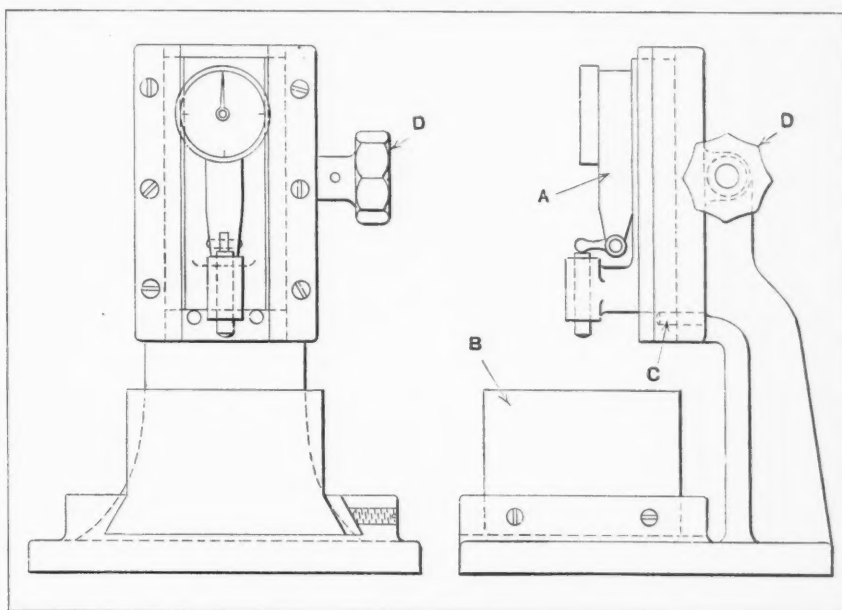
* * *

THE WORLD'S LARGEST TRANSFORMERS

The transportation of the four largest electric transformers ever built, from the plant of the Westinghouse Electric & Mfg. Co., Sharon, Pa., to Roseland, N. J., necessitated the strengthening of bridges and the temporary lowering of the tracks of the Erie Railroad a distance of 18 inches at Caldwell, N. J., in order to give the required overhead clearance. The transformers will be used to transfer power from the Pennsylvania Power & Light Co.'s plant at Bushkill, Pa., to

the Public Service Electric & Gas Co.'s system in New Jersey. Fifty-six cars were required to carry the transformers and parts. Each transformer is 35 feet high, weighs approximately 300 tons, and requires a floor space of 22 by 23 feet. More than three tank cars of oil, or 32,000 gallons, are required to fill each transformer.

The transformers are rated at 220,000 volts but were tested at 570,000 volts, which is believed to be the highest test voltage ever applied to a power transformer. The laminations in each transformer weigh 63 tons and the copper windings, having a total length of more than 32 miles, weigh 15 tons. The capacity of the transformers is sufficient to illuminate 6,000,000, 40-watt incandescent lamps, or approximately 200,000 ordinary six-room houses. In order to meet the loading requirements of the railroad, the oil was drained from the transformers and the shipping tanks were filled with dry nitrogen gas to preserve the insulating qualities of the coils during transit.



Gage for Testing Thickness of Small Interchangeable Parts

PROFILING THE COMBUSTION CHAMBERS IN CYLINDER HEADS

One of the most important operations in finishing automobile cylinder heads at the Packard Motor Car Co., Detroit, Mich., is the profiling or doming of the combustion chambers. For this operation, the cylinder heads are placed in one of the two

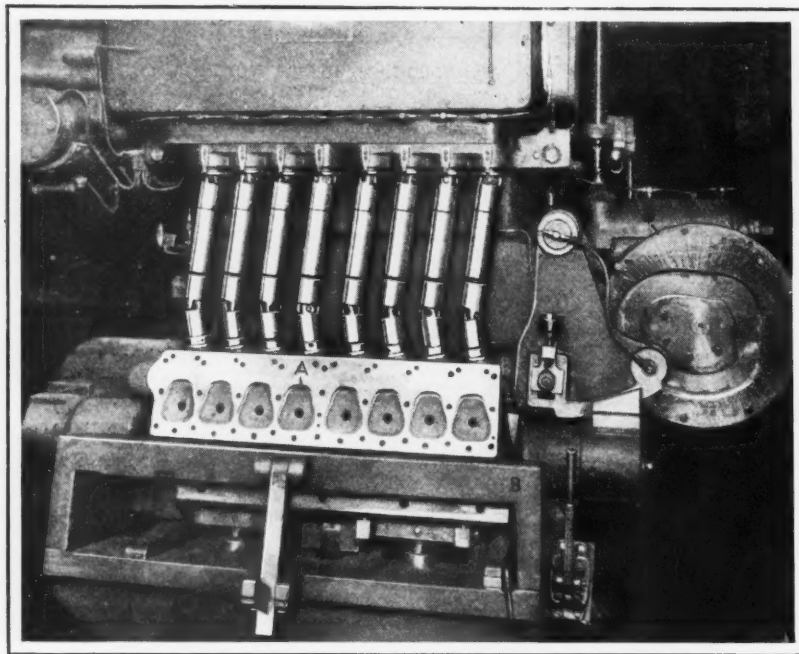


Fig. 1. Eight-spindle Profiling Machine Used for Finishing the Combustion Chambers of Cylinder Heads for Packard Automobiles

machines shown, the combustion chambers having previously been profiled around the edges to the outline shown at A, Fig. 1. When the parts leave the machine, the combustion chambers have been finished as indicated at A, Fig. 2.

The cylinder heads are placed one at a time in a fixture B, which is rocked backward and forward during the operation by a cam located inside the column of the machine. At the same time, the tools are moved sideways at right angles to the table movements, as the slide C in which the lower spindle bearings are mounted is moved from right to left by a roller engaging cam D. This movement of the bearing slide imparts the necessary tool movements, in combination with the rocking of fixture B, to machine the combustion chambers to the desired shape.

The spindles have knuckle joints, which permits them to change from the straight vertical position seen in Fig. 2 to the inclined position shown in Fig. 1. Cherrying cutters of the type seen at E, Fig. 2, are employed, and they remove about 3/32 inch of stock. Each spindle is water-cooled at the upper end, and the bearings are lubri-

cated by an adaptation of the chassis oiling system used on Packard automobiles. A pneumatic clamping arrangement facilitates loading and unloading of the work.

* * *

DRAWING TUBING FOR AIRPLANES

"The most interesting process in the production of parts for Boeing airplanes is the drawing of tubing in the draw-bench," states R. E. Johnson in *Automotive Industries*. The draw-bench is 42 feet in length, and consists primarily of a heavy endless chain, approximately 1 foot wide, which revolves over large sprockets at the ends of the rectangular metal casing for the chain. On top of the bench is a carriage with a lock grip for the tubing and a hook attachment for connection with the revolving chain.

The round stock tubing to be drawn is annealed in the electric furnaces of the heat-treating department, after which a die plug of the desired shape is attached to a long steel rod and inserted through the tubing. The end of this rod is then secured to a stationary clamp at the end of the bench. Next, the other end of the tubing is locked to the carriage which is connected with the chain. The power is now applied, causing the chain to revolve at a speed of 15 feet per minute. The revolving chain draws the tubing over the die plug, thus giving it the required cross-sectional shape. Square, rectangular, or stream lined tubing may be drawn, as well as special channel sections.

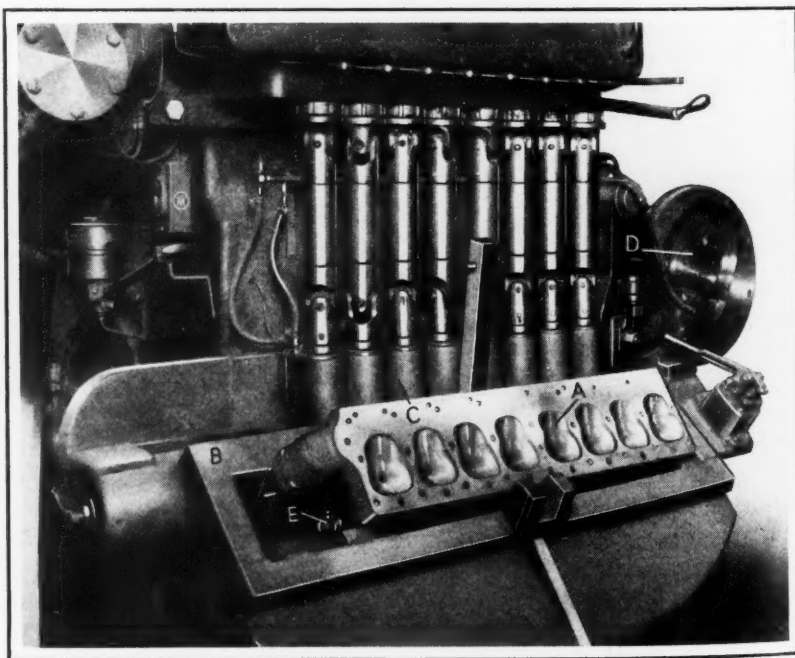
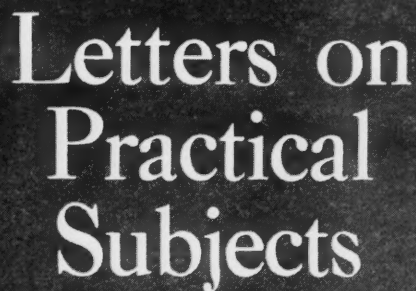
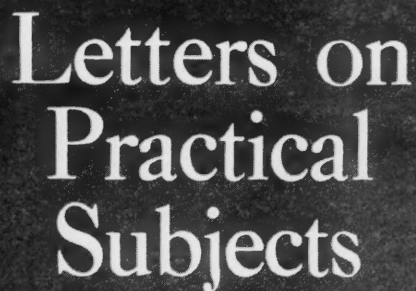


Fig. 2. Another Profiling Machine with the Cutter-spindles Straightened Out and a Finished Cylinder Head Lying on the Fixture



Letters on Practical Subjects

Letters on Practical Subjects

Letters on Practical Subjects

Letters on Practical Subjects

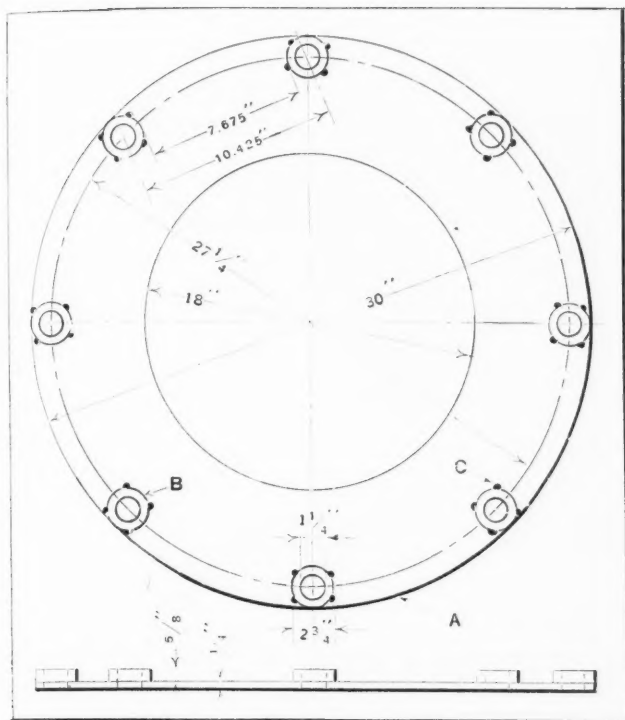
Letters on Practical Subjects

Letters on Practical Subjects

Letters on Practical Subjects

Letters on Practical Subjects

Letters on Practical Subjects



Jig of Arc-welded Construction

Referring to MACHINERY's Data Sheet No. 77, the distance of the chord for eight divisions was found to be 0.38268 times the diameter of the circle to be divided. Thus, the distance between the centers of the bushings $= 0.38268 \times 27.25 = 10.425$ inches, and the distance between the bushings $= 10.425 - 2.75 = 7.675$ inches.

Eight pieces of steel, $1/8$ inch by $3/4$ inch, were cut off, filed to a length of 7.675 inches, and placed between the bushings. Even spacing of the bushings was then obtained by having them in contact with the eight spacing bars and flush with the outside of plate A. The bushings were held in their evenly spaced positions by means of washers and the $3/8$ -inch bolts, while being electrically tack-welded in four spots, as indicated by the dots C. As a comparatively small amount of heat was required for making these welds, the hardness of the bushings was not materially affected.

In using the jig the first time, the 1 1/4-inch drill was fed completely through the 1/4-inch plate, thus completing the jig. Similar drill jigs of any required spacing can be constructed by making the bushings and plates of suitable diameters and providing spacing bars of the required lengths.

Portland, Me.

H. K. GRIGGS

EQUALIZING MULTIPLE FIXTURE

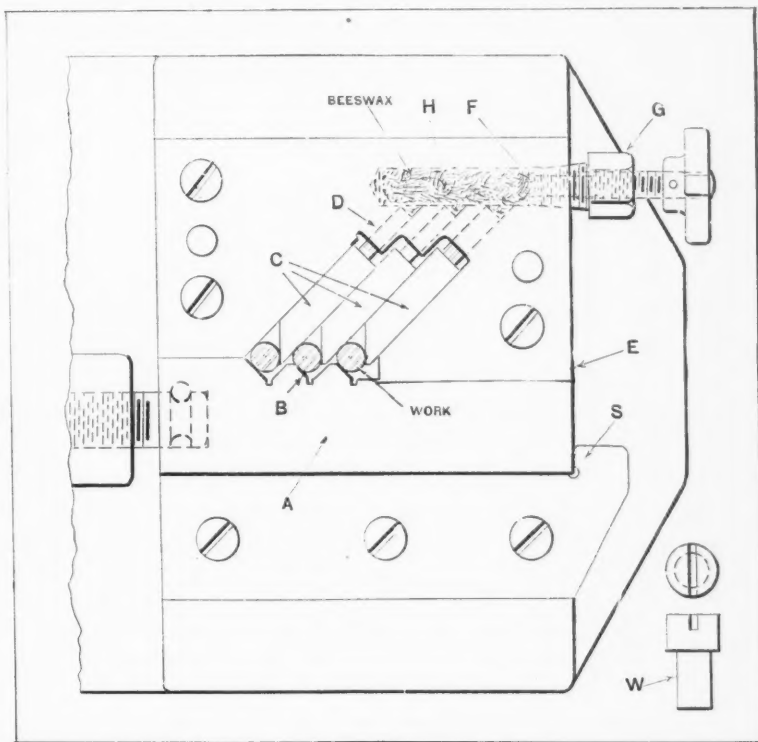
The problem of holding parts like the one shown at *W* in the accompanying illustration, when milling a slot or tongue central with the axis, is seldom solved

to the satisfaction of the tool designer. The customary method is to employ a multiple system of sliding V-blocks operated by means of a single screw or cam. This has never been entirely satisfactory in practice, for in order to obtain the required strength, it is necessary to space the parts quite a distance apart. Another difficulty results from the accumulation of chips in the slides. Also, the V-blocks have too short a bearing surface on the slides.

The fixture here shown, however, has none of the objections referred to. The distance between parts held in the fixture is reduced to the minimum, and there is no place for chips to accumulate. Also, the pieces are accurately centered or lined up for the line-milling operation.

At *A* is a slide having V-grooves *B* cut in one side. The sliding members *C* are backed up by round pins *D*, which are a slip fit in guide holes in the block *E*. The guide holes connect with the large hole *H*, which is filled with beeswax and sealed with an ordinary plug or a plug having a pressure plunger *F*, as shown. The beeswax serves to equalize the pressure exerted on the three clamping slides *C*. The writer has designed and placed in service a number of fixtures in which beeswax has been used as an equalizing agent, and in all cases the fixtures so equipped have proved satisfactory.

The slide *A* must always be returned to exactly the same position each time the work is clamped in place; otherwise, the parts will be crowded to one side or off center. Therefore, with either a screw- or a cam-operated slide *A*, it is well to have a fixed stop such as shown at *S*, against which the slide is forced. If the diameter of the work is held within accurate limits, a plain plug *G* without the plunger

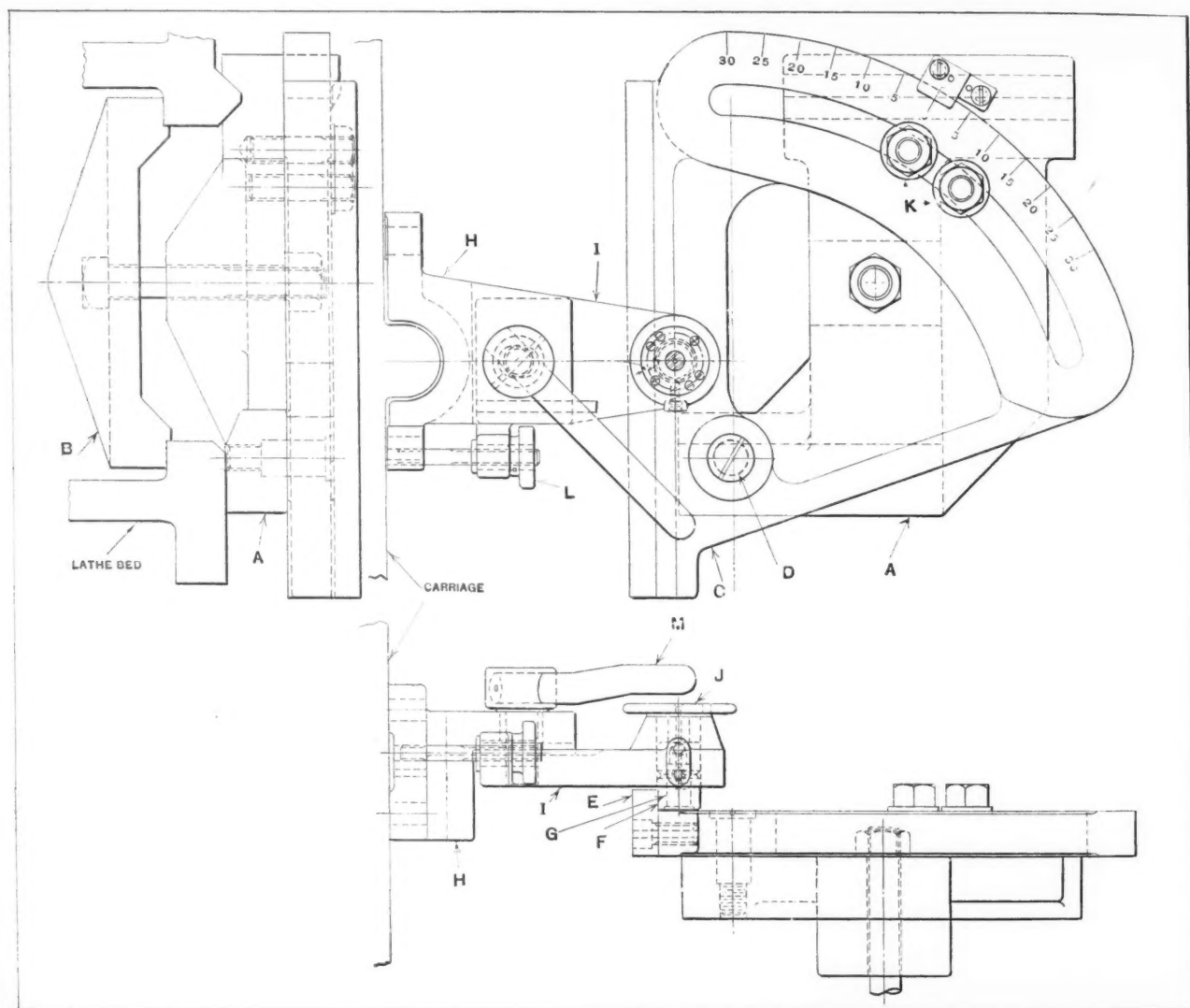


Multiple Fixture with Wax-operated Equalizing Clamping Jaws

F will be satisfactory, but when the work varies considerably, a plug like the one shown at *G* provided with a plunger *F*, should be used. The plunger *F* can be operated by a hand-knob or a plain plunger operated by a cam might be employed.

With an arrangement of this kind, the slide *A* is first moved forward into position; afterward, the wax is compressed by the plunger *F*, causing the work to be securely clamped in place. A cover plate (not shown) can be placed over the slides *C* to prevent chips from falling into the grooves. If

the bolt in the strap *B*. The graduated member *C* swings on shoulder screw *D* and may be set at any angle up to 30 degrees on either side of the zero mark. A hardened and ground steel bar is screwed tightly against member *C* and forms a true straight rail against which the roll *G* bears. The latter turns freely on a shoulder screw in the end of plunger *J*, which, in turn, is a sliding fit in the adjustable plate *I*, fastened to bracket *H*. This bracket is doweled and fastened by cap-screws to the right-hand side of the cross-slide, so that the



Graduated Bevel Guide for Turning Steep Bevels on a Turret Equipped Engine Lathe

there are shoulders on the work, as in the case of the piece shown at *W*, the shoulder can rest directly on top of the jaws. If there are no shoulders on the work, a bridge should be built across the bottom of the fixture to provide a support.

Woonsocket, R. I.

DONALD BAKER

BEVEL GUIDE FOR LATHE

The attachment shown in the accompanying illustration is used when facing steep bevels on an engine lathe. The lathe has no tailstock and is equipped with a turret on the cross-slide. The base *A* is rigidly fastened in position on the ways with

roller will follow the same path as the point of the cutting tool.

For inside beveling, the member *C* is swung to the left and fastened by the nuts *K*, the roller bearing on the side *E* of the rail. For outside beveling, the member *C* is swung to the right, with the roller bearing against the side *F* as shown. In order to allow shorter tools to be used in the other turret stations when the roll is used in the position shown, and to permit moving the carriage a sufficient distance away for loading and unloading the work when the roll is working on side *E* of the rail, the plunger *J* was incorporated so that the roll can be raised to clear the top of the rail. An advantage

in utilizing both sides of the rail is that no weights are required to hold the roll against the guide. The depth of the cut may be varied by loosening binder *M* and turning adjusting nut *L* in the proper direction.

With some slight changes in the design of the bevel guide shown, it may be made to suit other types of turret lathes equipped with cross-feeds.
Fairfield, Conn. J. E. FENNO

MULTIPLE DRILL HEAD DESIGN

Those connected with the manufacturing end of the automotive industry know the importance of a good, dependable multiple drill head for the rapid

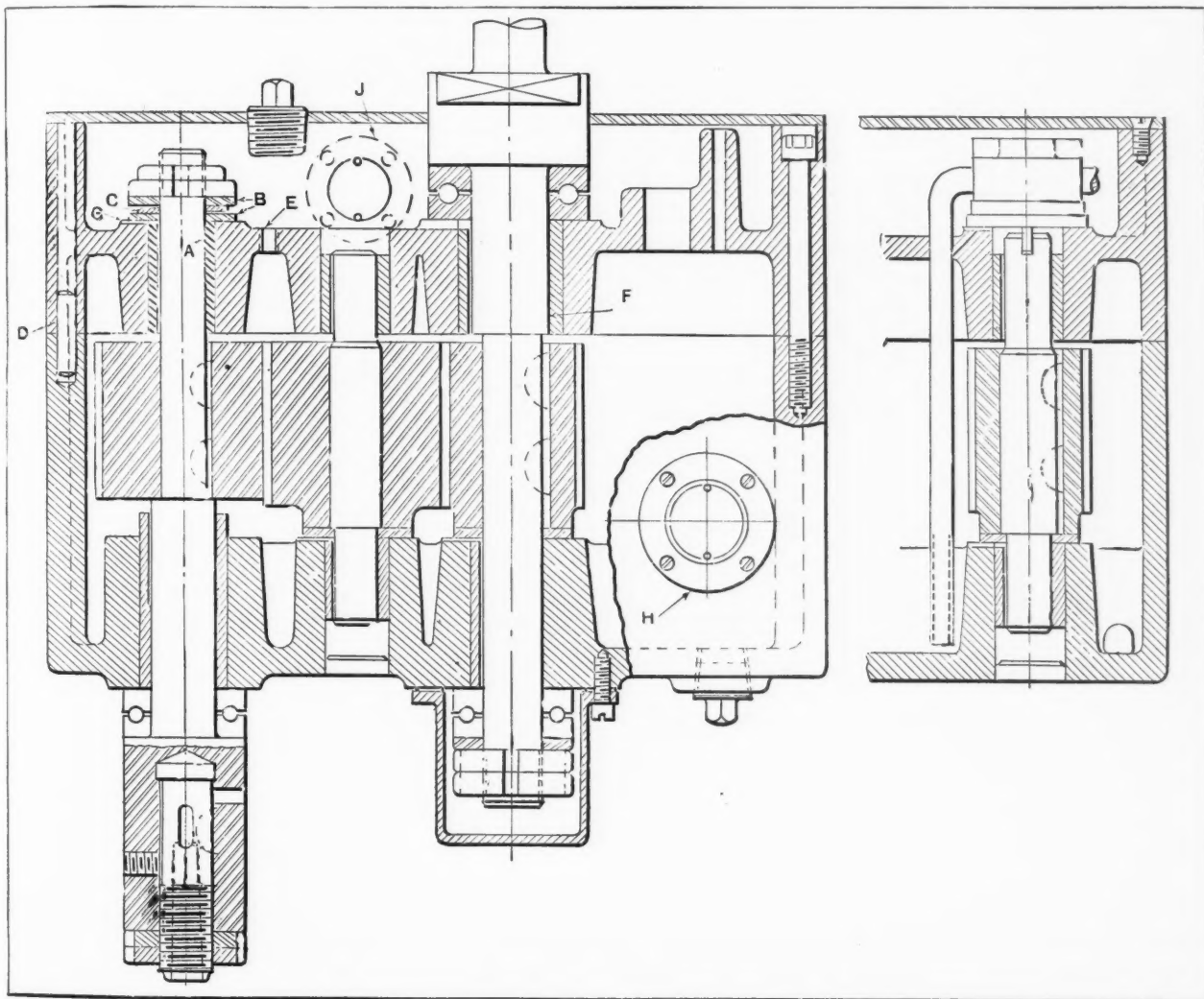
3. Pin *D* is a slip fit in the upper casting, and a press fit in the lower one.

4. Spindle sizes are as follows: 1/2 inch diameter for drills up to 3/8 inch diameter; 5/8 inch diameter for drills from 3/8 to 1/2 inch diameter; and 3/4 inch diameter for drills from 1/2 inch to 3/4 inch diameter.

5. All gears are made of steel.

6. Two oil gages are provided—and at *J* for the upper chamber, and one at *H* for the lower one.

7. The upper chamber is filled with lubricating oil, which flows into the lower compartment through a number of 1/4-inch tapped holes *E*. These holes can be either plugged or open, and serve as oil regulators.



Multiple Drill Head Used as a Standard or Master for Design

production of interchangeable parts. The multiple head shown in the illustration is the result of late developments in that line, and its general specifications, given in the following, may be of aid to draftsmen designing heads of this type.

1. All spindle bushings are made of cast iron. Oil-grooves are provided along the entire length of the bushing *A* and in the bearing boss *G*.

2. Steel washers *B*, hardened and ground, are separated by a cast-iron washer *C*, provided with four oil-grooves as shown.

8. At the right of the illustration is shown a section through the shaft of an oil-pump driven by main spindle *F*.

9. If the amount of oil pumped from the lower chamber into the upper one is excessive, one or two plugs are removed from holes *E* to increase the downward flow, until the gage at *H* shows a desirable level. If the gage at *J* shows too low a level, one or two holes are plugged and the downward flow is decreased. An efficient lubricating system is obtained in this way.

10. The location of oil gages is quite important. The gage at *J* should be placed so that its center line is 1/2 inch above the spindle bearing boss.

11. The center line of gage *H* should be 5/16 inch above the spindle bearing boss.

12. All shafts and spindles are carburized, hardened, and ground.

13. All threads over 3/4 inch diameter have 16 threads per inch. All threads 3/4 inch or less are S.A.E. standard.

14. The gears should be arranged, if possible, so that the drill resistance will tend to force them out of mesh rather than to push them into mesh.

15. A drill speed of 70 feet per minute is recommended for cast iron and steel. The reaming speed for these metals should be reduced 25 per cent.

Ann Arbor, Mich.

A. P. GWIAZDOWSKI

COMBINATION BENDING AND TRIMMING DIE

The hot-bending and trimming of machine steel plates or flat stock can often be done quicker and at a lower cost in a combination die than by the usual blacksmith shop methods. A typical example of this class of work is the production of levers like the ones shown at *A*, Fig. 2, from 3-inch by 1/2-inch machine steel. The die employed for this work, shown in this illustration and also in Fig. 1, bends the hot stock to shape on the first stroke, and on the second, trims the ends of the two levers, the bent part being cut or trimmed at the middle point so that two levers are produced at one time.

While the average blacksmith can forge about twenty-five to thirty levers per day, the die illustrated has a capacity for producing 400 pieces per day of eight working hours. When several thou-

sand parts of this kind are to be made, it is obvious that a considerable saving results from the use of a die like the one illustrated. Besides the advantage of forming and trimming two levers

at a time, the work produced is uniform and there is no variation either in the amount of offset or in the over-all length. This facilitates drilling the levers on an inexpensive drill jig provided with fixed locating points.

The details of the punch and the die-heads are shown in Fig. 1. Sliding blocks *C*, *D*, and *E* are fitted with tool-steel knives *F*, *G*, and *H*, and are held in place by bolts *I*, which are a sliding fit in the body of the punch *J*. The trimming knives are brought into the operating positions only when the backing pieces *K*, Fig. 2, are put in the openings shown at *K*, Fig. 1. The first operation consists simply of bending the hot flat stock to the shape indicated at *W*, Fig. 1. The pressure is then released and the bottom die lowered just enough to allow the U-shaped backing pieces to be put in place above blocks *C*, *D*, and *E*.

On the next stroke of the press, the flat stock is parted by the forming cutter *G* which trims the ends of the two pieces to a circular shape, while the opposite ends of the pieces are cut to the required circular shape by cutters *F* and *H*. At the end of the trimming operation, the levers are given a final "squeeze" to correct inaccuracies in shape.

The four side plates *P* are provided with slots *R* which engage pins *S*, thus securing proper alignment between the top and bottom members of the die. The trimming knives are flushed frequently with water, in order to carry away the heat absorbed through contact with the hot flat stock, so that the temperature of the cutting edges will be retained. Two of the bent and trimmed levers are shown at *A* in Fig. 2. The piece cut from the stock in trimming the ends and separating the levers is shown at *B*, and the pieces trimmed from the opposite ends, at *C*. While the piece *B* may seem to represent considerable waste stock, it is inadvisable to cut down the width of this part because of the difficulty of retaining a good cutting edge on a thinner punch than the one used.

Calcutta, Ind.

A. G. AMOS

* * *

A nation-wide airplane express service that will deliver its consignments by motor truck direct from the landing field is being formed by the National Air Transport and the Curtiss-Wright group, two of the largest factors in the commercial air field, according to an announcement in *Sales Management*.

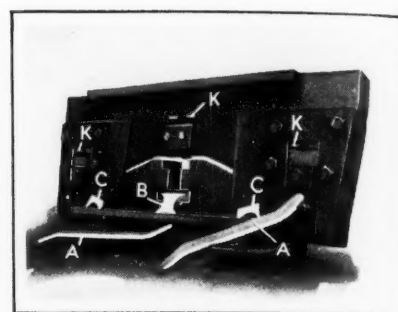


Fig. 2. Bending and Trimming Die for Levers A

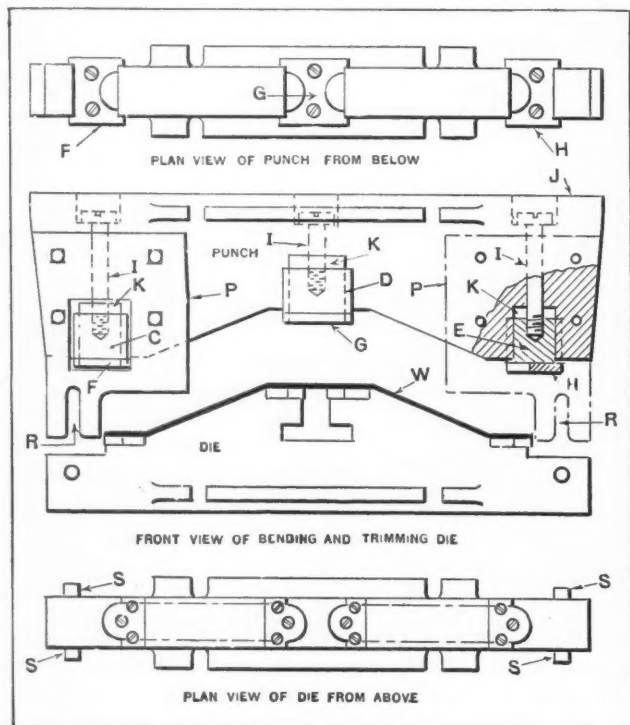


Fig. 1. Upper and Lower Members of Bending and Trimming Die Shown in Fig. 2

How Do Successful Foremen Handle Men?

Qualities Essential to Success in Dealing with Men, and Ways in which to Meet Different Situations

A GROUP of foremen, after having discussed the qualities that a foreman ought to possess in handling his men, came to the following conclusions: He should be a good organizer, tactful and diplomatic, and should have the welfare of the men as well as the company at heart. He should be able to analyze his problems and overcome difficulties by straight thinking and calm decisions, thus securing the confidence of his men. It is self-evident that he must thoroughly understand the work of his department; yet he should be open to suggestions and be able to compromise when necessary. He should commend men rather than censure them, whenever possible, and should work with them so that they will feel that he is cooperating with them toward a common end, instead of bossing them. In his personal relations with the men he should be friendly and yet firm.

Gaining the Confidence of a New Man

To gain the respect and confidence of a new man, the foreman should try to get acquainted with him and to put him on such work as will present the least difficulties to a beginner. He should acquaint him with the work and the surroundings and instruct him how to work safely. Then he should check the man's work, and if he has made any mistakes, explain to him how they could have been avoided. He should explain to the man the company's wage policy, and if instruction books are given to the men, he should see to it that he has read these instructions and understands them.

How to Handle Complaints

If a foreman attempts to curb or restrict an employe in presenting a grievance, this only makes matters worse, as such action tends to arouse the fighting spirit. There is nothing more conducive to creating friendly relations in a plant than to have it generally known that anybody with a grievance or complaint can present it freely to whatever authority he feels must be reached with the complaint. For example, it might be a rule that all complaints must first be brought to the foreman, but if the employe feels that he is receiving no attention, he should have the right to bring his complaint to the superintendent, or works manager, if need be. The knowledge on the part of employes that they can freely present complaints and grievances has a tendency to minimize the seriousness of the grievance in their mind.

The conference between the foreman and the man, when a grievance is presented, should be so arranged that there will be no interruptions or distractions. By receiving the complaint in a

friendly and sympathetic manner, no matter what it may be, the employe is placed in a normal state of mind and the emotional pressure largely eliminated. There must be an evident desire shown on the part of the foreman to obtain the facts and to analyze the motives involved. Then a definite decision must be rendered. Half measures only aggravate conditions of this kind. Finally, after the decision is rendered, it should be made clear to the employe that if he feels that it is not fair, he is entitled to appeal to someone higher in authority.

Restoring a Man's Interest in His Job

A foreman can do a great deal to restore the usefulness of a man who appears to have lost interest in his work. He should find out the cause of the difficulty either by talking to the man right on the job, or by asking him to drop into the office; he may even call on him at his home. He should encourage the man to tell his whole story, and even if the man finds fault with the foreman or the company he should be allowed to unburden himself completely without interruption. Then his complaint should be fairly considered, the working conditions investigated, and the foreman's own attitude examined. The difficulty may often be due to the fact that the workman has outgrown his job and that he ought to be given more responsibility.

How Does a Foreman Gain Knowledge of the Ability of His Men?

The question "How can a foreman know the ability of his men?" was answered in the following way at a foremen's conference: By keeping in close contact with his men during working hours, by carefully inspecting the quantity and quality of their work, by trying men on different classes of work, by engaging them in conversation and obtaining suggestions from them, by noting whether or not a man goes about his job with confidence, and by learning to know his personal habits.

What Makes a Good Man Leave His Job?

The reasons why good men leave to go elsewhere were analyzed by a group of foremen as follows: The most common cause is that the man believes he will have better opportunities to get ahead somewhere else, and a better chance, perhaps, to use his own ideas and ability. Sometimes the location of the plant may not be convenient to the man's home, working conditions may be unsafe, the foreman may be a "nagger," or it may be a case of plain wanderlust. With younger men, the sport activities in some plant organizations are an attraction, and they like to work in a plant that gives them a

chance to get on a baseball team or engage in some other sports.

The Problem of Laying off Men

Assume that, due to lack of work, it is necessary to lay off about one-tenth of the men in a department. What should guide the foreman in determining which men to let go? In answer to this question one foreman conference gave the following answer:

First, the foreman must keep in view the completeness of the organization; after that the efficiency of the men should be considered; and next their loyalty to the company, their personal honesty and character, as well as their promptness and regularity. Married men with families should also be given preference over single men. Next should be considered length of employment, the man's general financial condition and obligations (for example, if a man had just bought a home), and finally, whether the man is a good citizen.

* * *

THE ROCKFORD JUNIOR ENGINEERING SOCIETY

An interesting item of news comes to us from Rockford, Ill. Early this year the students in the cooperative industrial course at the Rockford High School formed what is known as the Rockford Junior Engineering Society. The students in the industrial cooperative course alternately spend two weeks in school and two weeks in a shop where they are learning the machinist's trade. The course has an enrollment of over sixty members and the purpose of the society is to promote a greater interest in engineering among the high school students taking this cooperative course.

The objects of the society are attained by inviting prominent engineers engaged in the Rockford industries to address the members on subjects of interest and value to them. Occasionally the members visit some of the leading industrial plants in Rockford and vicinity.

It would seem that local societies of this kind formed among the younger men engaged in mechanical work should prove of great value and stimulus to those planning to take up mechanical engineering work as their life vocation, and young men in other cities would doubtless promote their own best interests by following the example of these young men of Rockford.

* * *

The total production of automobiles in the entire world in 1928 amounted to 5,203,000 cars, which was 1,044,000 cars more than in the preceding year. The United States' share was nearly 84 per cent.

A GASOLINE ELECTRIC AUTOMOBILE

According to information obtained from the General Electric Co., Schenectady, N. Y., a new type of pleasure automobile which has no clutch or gears to shift and is capable of quick pick-up and fast speed in hilly country has just been completed. The car is a combination 60-horsepower gasoline and electric automobile, the first of its kind ever built, and is the result of the combined experimental work of engineers of the General Electric Co. and the Rauch and Lang Corporation of Chicopee Falls, Mass.

In external appearance, the car looks like any gasoline-driven automobile. The real difference is in the mechanism under the floor boards and the controls at the driver's seat. There are but two foot-pedals, one to the left for the brake and one to the right for the gas. The clutch pedal and the gear-shift rod or lever located at the right of the driver in ordinary cars are eliminated. The emergency brake at the left of the driver and the starting button at the far right are the same as in other cars.

In addition to the absence of the clutch and gear shift, other features of the new car are that it is impossible to stall the engine without actually shutting off the ignition, and it is impossible to start with a jerk. Even though the accelerator pedal is jammed down to the floor board, the pick-up will be gradual and smooth because of the automatic electric equipment. There is also an outstanding safety feature, for the driver can keep both hands on the wheel and his eyes on the road at all times after the car has once started.

The electric generator is mounted directly on the flywheel housing of the gas engine, the generator armature revolving at exactly the same speed as that at which the engine turns over. A few inches back on the generator, or approximately under the front seat, is the electric motor, connected by cable to the generator and coupled by a short drive shaft to the rear axle. As the generator is speeded up, more electricity is fed to the motor, and as the motor picks up so does the speed of the car.

* * *

It has been announced by the Austin Co. of Cleveland, Ohio, that the company has been awarded a contract for designing and constructing a large automobile plant for the Soviet Government at Nishni Novgorod, Russia. Twenty million dollars has been provided for the project. The plant will be designed to produce 100,000 four-cylinder automobiles annually. According to present plans, the factory will be completed in about two years.

An Electrically Controlled Gear Shift

An Automatic Radial Engagement of Worm and Spiral Gearing Furnishes a Slow Forward and a Fast Return Speed

By FREDERICK A. PEARSON, Director, Pearson Research
Laboratories, Great Barrington, Mass.

THE gear shift shown in Figs. 1 to 5, inclusive, was designed to meet these requirements:

- (1) With a constant driving shaft speed, two speeds of the driven shaft had to be available in the ratio of 1 to 30 and in opposite directions.
- (2) No clutches could be used in driving train.
- (3) The design had to provide a push-button control.
- (4) Selected speed gearing had to be locked in position electrically.
- (5) Shifting of the gearing had to be performed with power furnished by the driving motor.

Planetary Gearing Permits Electrical Control

To meet the fifth requirement, a system of planetary gearing receiving its energy from the driving shaft, offered the greatest possibilities. A planetary movement lends itself readily to electrical control inasmuch as one of its moving parts may be held stationary to effect movement of another part. This gearing system can be controlled with the simplest of electrical devices, such as a solenoid moving a plunger against a spring to bring a trip into contact with first one and then another of the planetary elements.

With the planetary system as a starting point, radial engagement of the shifting gears was decided upon. It then followed that by mounting these gears on a shaft which could itself be moved intermittently in an orbit by the planetary gearing,

the shifting gears could be readily engaged or disengaged as required. It was also obvious that the shifting gears and the planetary gears could be driven from one driving shaft.

A Practical Application of the Gear Shift

The particular gear-box illustrated has been applied to the "Opacimeter" (an instrument made by the Pearson Research Laboratories for the measurement of a moving web of paper), to move upper and lower carriages of this instrument. These carriages are driven by chains from the sprockets on shaft *L*, Fig. 1, at a forward speed of 1/2 foot per minute and a return speed of 15 feet per minute. The mechanism is controlled either automatically from track contacts or through push-buttons operated manually from a control cabinet.

Power for Driving and Shifting Delivered from One Source

The driving motor is attached to the coupling on the outer end of shaft *A*, which transmits power to worm *B*, the latter, in turn, driving shaft *D*, Fig. 2, at a reduced speed, through worm-wheel *C*. Shaft *D* is fastened to one end of universal joint *E*, the other end of which is connected to shaft *F*. The latter is called the "orbital" shaft owing to the movement it receives from the planetary gearing, as will be explained. It carries spiral gear *G* and worm *J* for the forward and return speeds.

It will be obvious that when the orbital shaft is

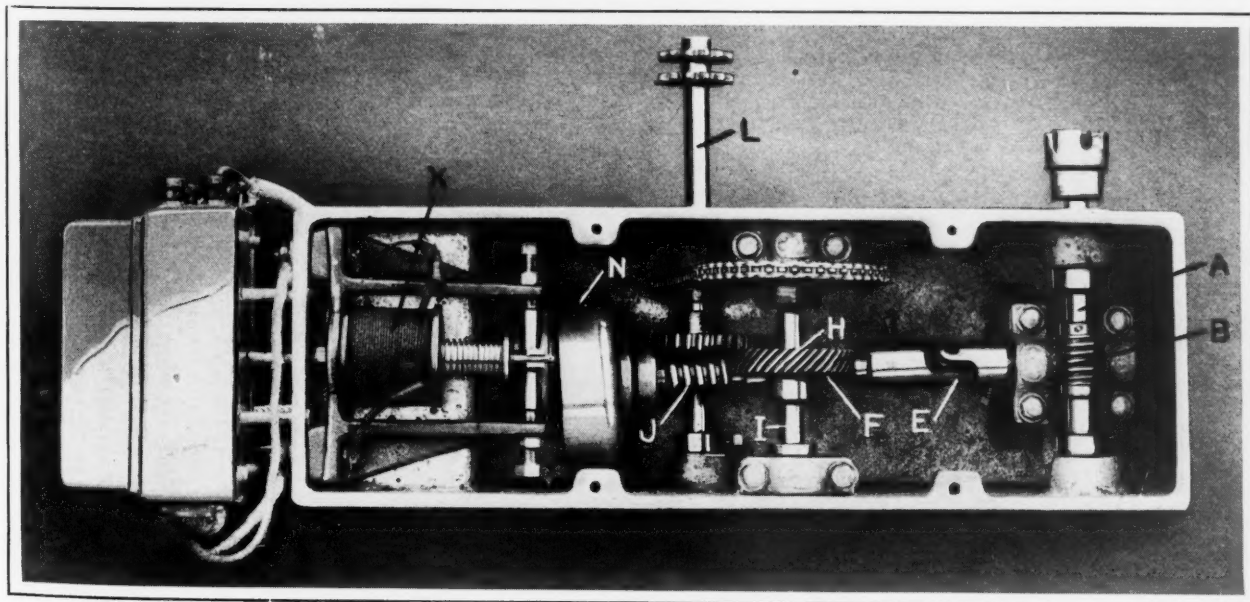


Fig. 1. An Electrically Controlled Gear Shifting Mechanism Which Automatically Gives a Slow Forward Speed and a Fast Return Speed to a Power Output Shaft

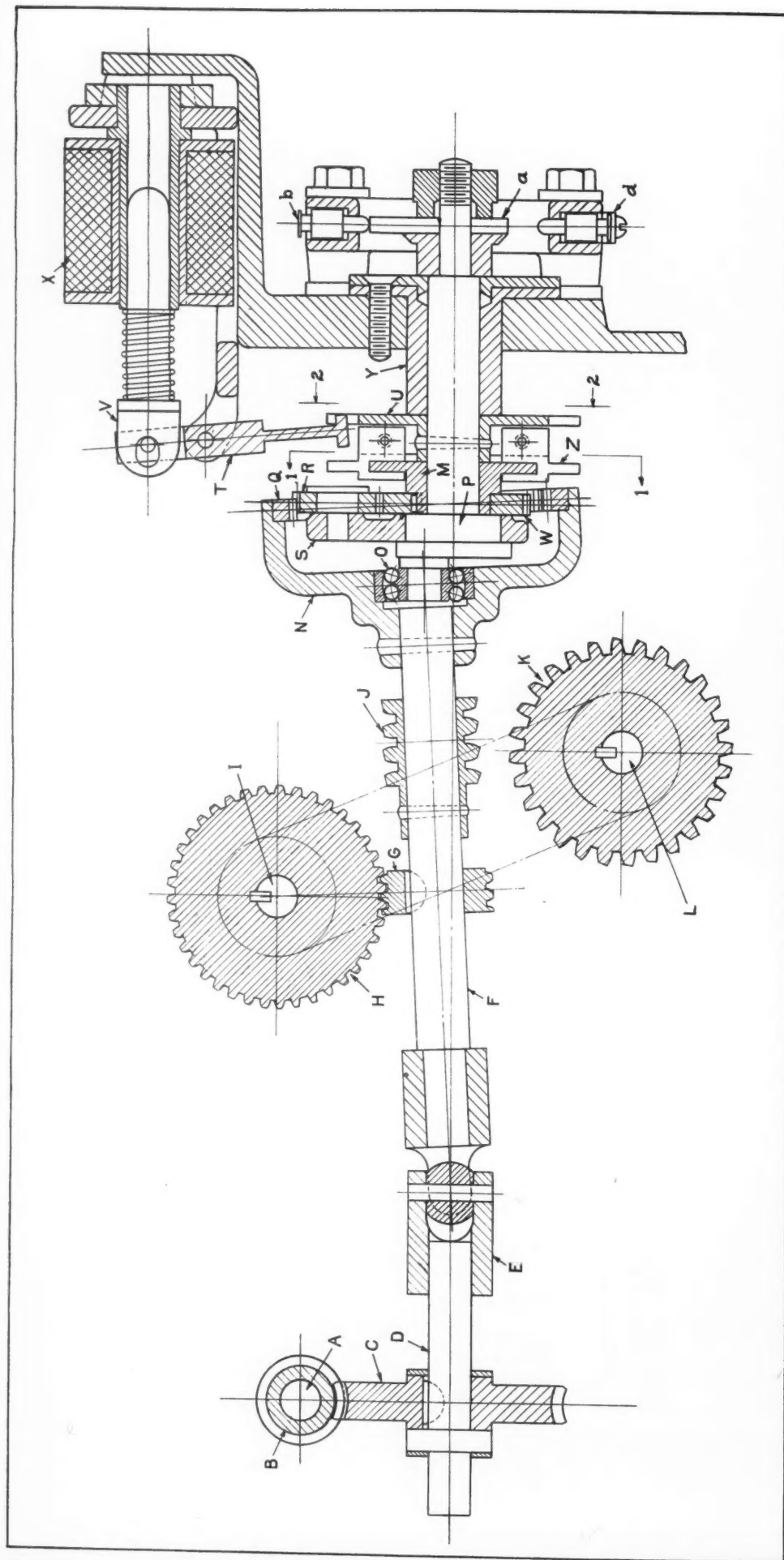


Fig. 2. Sectional Side Elevation of the Gear Shift Mechanism, Reversed End for End in Comparison with Fig. 1

in its upper position, spiral gear *G* meshes with gear *H* on shaft *I* and that when the orbital shaft is in its lower position, worm *J* engages worm-wheel *K*, the latter being mounted on shaft *L*. Shafts *I* and *L* are interconnected by sprockets and a chain, and the latter shaft transmits the drive to the "Opacimeter" carriages.

Shaft *F* carries cup *N* on its right-hand end, as seen in Fig. 2, which contains the outer race of a self-aligning ball bearing *O*. The inner race

is affixed to the crank-arm of shaft *P* on which is also mounted arm *S* of the planetary gear system. Sun pinion *W* of the planetary system is at liberty to rotate on shaft *P*, together with disk *M*, to which the sun pinion is attached. There is another disk *U* pinned to the crank-shaft. The latter is free to rotate in bushing *Y*. It extends outside of the box and carries a cam *a* by means of which the electrical control is effected. Cup *N* carries at its outer extremity an

internal ring gear *Q* which, due to the eccentric orbit of shaft *F*, must necessarily be slightly out of line with pinion *R*, arm *S* and sun pinion *W* of the planetary system.

Riding on disk *M* is a clutch *Z* in which notches are cut, as well as in disk *U*, as shown in Figs. 3 and 5. Pins on trip *T*, Fig. 2, can fall into the notches of either of these parts when the trip is moved by plunger *V*. The plunger is actuated by solenoid *X* and is backed up by a coil spring.

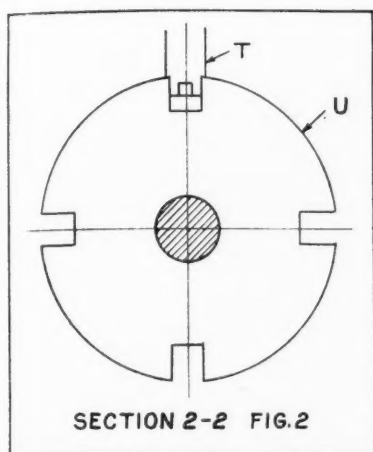


Fig. 3. Disk U Which is Employed to Lock Crankshaft P Stationary

the crankshaft is locked with the crank-arm in the upper position, by trip *T* engaging a notch of disk *U*, and cannot revolve until the trip releases the disk. Consequently, shaft *L* is driven in reverse at its high speed through the sprockets and chain that interconnect shafts *I* and *L*.

Cup *N* and its internal ring gear *Q* rotate constantly and, therefore, pinion *R* similarly drives sun pinion *W*, which, in turn, actuates the disk *M* and clutch *Z*. When it is desired to move shaft *F* from its upper to its lower position, trip *T* must be disengaged from disk *U*, thus releasing arm *S* and crankshaft *P*, and engaged with clutch *Z*. Now, clutch *Z*, which was previously rotating, is held stationary and arm *S* is given an axial movement together with shaft *P*, as a result of the driving action given pinion *R* by ring gear *Q*. When shaft *P* has revolved through 180 degrees, it becomes necessary to disengage trip *T* from clutch *Z* and to reengage the trip with disk *U*.

It will thus be seen that the operation of the motion of trip *T* to engage the slots of disk *U* mechanism is simplified to a matter of timing and clutch *Z*, as required. This timing is effected by means of cam *a*, which is designed to touch contacts *b*, *d* and *e*, Figs. 2 and 4, at the proper instant. This arrangement gives the important advantages that electric current need be supplied to solenoid *X* only during the period of shifting gears. When the shift has been accomplished,

Shifting from Slow Forward to Fast Return Speed

It will now be apparent that by turning crankshaft *P*, shaft *F* can be caused to move through an orbit which carries it from the lower to the upper position and causes the disengagement of worm *J* and the engagement of spiral gear *G*. As shown in Fig. 2,

cam *a* breaks the chosen circuit and shaft *F* remains locked in its upper or lower position, as the case may be, until the solenoid is again energized. The pins that act between cam *a* and the contacts are made of an insulating material and the casting to which the contacts are attached is insulated from the housing.

Ready Engagement of the Gear Teeth Assured

Obviously, worm *J* and gear *G* will not always be so positioned, when either of them is about to be engaged, that their thread or teeth, respectively, will be opposite to tooth spaces of their corresponding gears. Therefore, if shaft *F* were connected direct to shaft *P* without any possibility of slippage through the planetary system, the breakage of parts would inevitably result. This is obviated through the action of clutch *Z*.

When trip *T* engages the clutch, disk *M* is held and orbital motion is given to shaft *F*, as previously described. However, should the thread of worm *J* or the teeth of gear *G* meet squarely with the teeth of the driven gear, the orbital rotation of shaft *F* would cease, and disk *M* would start to rotate and slip within clutch *Z* until the axial movement of shaft *F* brings the teeth into the proper meshing relation.

A further limiting condition arises in bringing worm *J* into mesh with worm gear *K*. This is a wedging effect resulting from slippage of the two

parts upon each other. It is overcome by cutting back the end surfaces of the worm and worm gear teeth at an angle of approximately 15 degrees to the tangent. This allows the worm gear to readily slip backwards through a distance of one tooth, should the worm thread meet the worm gear teeth squarely.

The mechanism runs completely immersed in oil and changing of

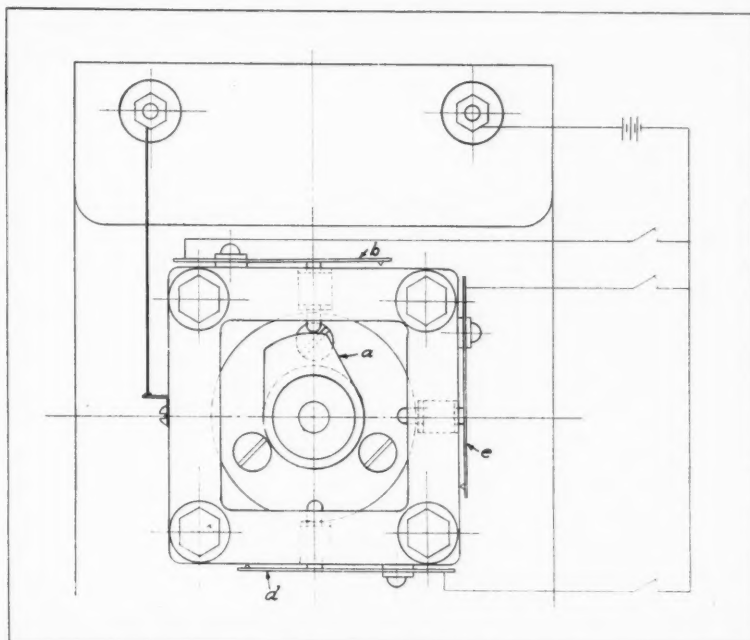


Fig. 4. View Showing the Arrangement of Cam "a" and its Electrical Contacts at the Right-hand End of Fig. 2

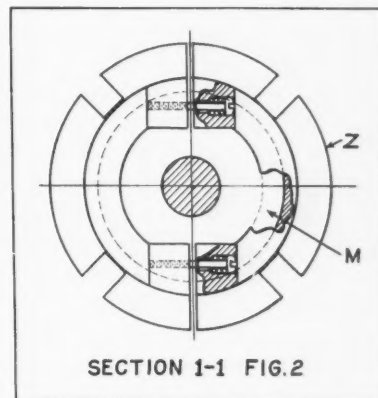


Fig. 5. Details of Clutch *Z* and Disk *M* Which Lock Sun Pinion *W*

the direction and speed of shaft *L* is effected noiselessly except for the clicking of trip *T*. While worm and spiral gearing are used in the particular mechanism described, spiral or bevel gears could be employed as readily.

Arrangement of the Electrical Control

The arrangement of cam *a* and the electrical contacts depends upon the complexity of control required. In the gear shift illustrated, one neutral position was desired, besides the two meshing positions and it is for this reason that contact *e* is provided. However, in place of a neutral position, more gears might be used to provide several forward and return speeds of shaft *L*. The housing seen at the left of the gear-box in Fig. 1, contains two relays which give a group control of the shifting gears.

* * *

GRAY IRON INSTITUTE ANNUAL MEETING

The Gray Iron Institute will hold its annual meeting at Hotel Cleveland, Cleveland, Ohio, October 16. The day previous will be devoted to meetings of the various committees and of the board of directors. The entire day and evening of October 16 will be devoted to discussing the interests of the gray iron foundry industry. Committees and officers will present plans for future procedure, and matters important to the industry will be considered. All executives engaged in the gray iron industry, whether members of the Gray Iron Institute or not, are invited to attend. The manager of the Institute is Arthur J. Tuscany, Terminal Tower Building, Cleveland, Ohio.

* * *

RECORD FREIGHT TRAFFIC EASILY HANDLED

The record freight traffic, which has been moved so far this year by the railroads of this country, has been handled with fewer freight cars and locomotives than at any time since 1923, according to the Car Service Division of the American Railway Association. Notwithstanding that fact, and the steady growth that has taken place in recent years in the industrial development of the nation, the railroads have been able to meet transportation requirements without car shortage except in a few isolated instances and then only of short duration. This achievement of the railroads has been largely brought about by the steady increase in the capacity of freight cars and the power of locomotives, together with improved operating methods.

THE 1929 CENSUS OF MANUFACTURES

With a view to giving to business and industry, as definitely as possible, the kind of information and data that are of the greatest use and practical value in the conduct of business, the forthcoming Census of Manufactures covering the year 1929 will be planned along lines laid out by men prominent in industry and business. The Secretary of Commerce, Mr. Lamont, has appointed a committee under the chairmanship of Colonel L. S. Horner, president of the Niles-Bement-Pond Co., to aid the Bureau of Census by acting in an advisory capacity on matters pertaining to the Census of Manufactures to be taken early next year. This committee will determine upon the questions to be asked in the forthcoming Census, limiting the questions to those of

practical value to manufacturers. The committee will also advise upon the tabulations subsequently to be made, which will be dealt with entirely on the basis of their value to industry.

At the first meeting of the advisory committee in Washington, it was decided to recommend a complete census covering all manufacturing plants, regardless of size. In the past, smaller plants, the production of which did not exceed a certain minimum figure, have been omitted. The committee also approved of the policy of the Bureau of Census to confer with industrial organizations and with representative members in each industry in formulating schedules especially adapted to the industry in question.

The Census Bureau is in a position to be of great service to the industry, when the information collected and tabulated is of the practical character that the industry needs. Through this new step of obtaining the cooperation of an advisory committee of leading manufacturers, it is likely that the information available will be of greater value than ever before. Manufacturers all over the country can contribute largely to the success of this undertaking of the Census Bureau by carefully filling in the questionnaires sent them and returning them promptly.

* * *

A. S. M. E. FUELS MEETING

The Fuels Division of the American Society of Mechanical Engineers will hold its third annual fuels meeting at Philadelphia, Pa., October 7 to 10. An extensive program of technical papers has been provided, including over twenty-five subjects, which will be presented during sessions covering four days.

Steel Treaters Discuss Important Problems

Uniformity in Carbon Steel, Properties of High-strength Cast Iron, and Improved Testing Methods are Among the Subjects Covered

IT is difficult to select from the great number of papers of interest to the metal-working industries, presented at the annual convention of the American Society for Steel Treating, held in Cleveland during the week of September 9, those papers that are of the greatest significance, because all of the papers contained information of great value to some branch of the industry. One paper, however, of broad interest to everyone engaged in the machine shop field dealt with the behavior of carbon steel in quenching, and a brief abstract of this paper may be of particular interest. The complete papers read before the convention may be obtained by addressing the American Society for Steel Treating, 7016 Euclid Ave., Cleveland, Ohio.

A Plea for Greater Uniformity in Carbon Tool Steels

In his paper on carbon tool steel, G. V. Luerssen of the Carpenter Steel Co., Reading, Pa., emphasized the necessity for uniformity in carbon tool steel, if uniform hardness results are to be expected. Carbon steel would be suitable for many purposes for which alloy steels have been substituted, were it possible to obtain carbon steels with uniform hardening characteristics. The author pointed out that the substitution of alloy steels for plain carbon steels has undoubtedly been resorted to needlessly in many cases. These cases are often those in which the carbon steels have at times produced remarkably fine tools, while at other times they have failed to give satisfactory results. The problem of obtaining uniformly good tools has been met by using alloy steels when it might have been solved by securing a uniform high-quality carbon steel.

Furthermore, there are many purposes for which carbon steels are superior to alloy steels. This is particularly true of the class of tools which require a very hard surface to withstand wear or battering, and a tough interior to withstand splitting. Such conditions are encountered in heading dies, shear blades, and similar tools.

Aside from the fact that carbon steels are eminently adapted to certain classes of service, they are often very desirable from the point of view of the toolmaker. They are more easily forged than most alloys, easier to anneal, easier to machine, and simple to harden. In many cases, they are cheaper, and more readily obtainable from stock. With all these things to recommend their use, there appears to be no question that the improvement of carbon tool steels is a subject worthy of further study.

A Five-year Study Undertaken to Develop Means for Obtaining Uniform Carbon Steels

In the course of a research covering about five years, conducted for the purpose of developing

methods for the manufacture of uniform carbon tool steel, studies were made of the peculiarities met with in the hardening of tool steel, especially the following: The difficulty of hardening tools from certain bars of steel without soft spots, when other bars of presumably the same steel had given satisfactory results; the difficulty of cracks developing in water hardening; the change of size of some tools in hardening, varying from the change in similar tools made from steel of the same composition.

In the study made it was found that these difficulties depend largely upon two properties in the steel—the hardness penetration and the quenching range. It was found that when these two properties are controlled within close limits, the steel will give uniform performance in service. The author of the paper did not touch upon the methods of manufacture, but he stated that the properties of hardness penetration and quenching range depend largely upon the conditions in the melting furnace, and that in order to keep these properties uniform from heat to heat, it is necessary to duplicate in exactly the same way, in every instance, the many details entering into the melting operation.

Every Branch of Metal-working Industry is Benefited by Uniform Tool Steel

In conclusion, the author said: "To summarize, then, the production of tool steel having uniform hardening characteristics is of advantage to designer, toolmaker and hardener alike. For the designer it assures a definite and reliable penetration of hardness, making it possible to design sections in such a manner as to reduce breakage and distortion in hardening to a minimum. For the toolmaker it assures greater uniformity in dimension change, enabling him to make definite allowances for such changes. It also assures uniformity of performance in finish grinding. For the hardener it assures constant behavior in heat-treatment, enabling him to more readily standardize his practice. With the introduction of more and more automatic equipment in the hardening room, this has grown to be an important factor. It assures less breakage in hardening and less trouble in size change.

"It seems well within the scope of the activities of the American Society for Steel Treating to foster cooperation between the steel manufacturer and the user, so that, on the one hand a uniform tool steel will be supplied, and on the other, a correct heat-treatment will be applied. Many differences of opinion must needs arise between the maker and consumer, but it is believed that a common ground can be reached by knowledge of the material."

High-strength Cast Iron

Attention was called by E. J. Lowry, consulting engineer, Detroit, Mich., to the possibility of obtaining a high-strength cast iron without materially affecting the machineability of the cast iron. Mr. Lowry first made a comparison between European and American foundry practice, and pointed out that European investigators have probably advanced further in the development of high-strength cast iron than American investigators. An abstract of Mr. Lowry's paper will be found on page 162 of this number of MACHINERY.

Improvements in Refractory Linings for Heat-treating Furnaces

In a paper by William J. Merten, metallurgical engineer of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., dealing with improvements in the refractory lining of heat-treating furnaces for high-temperature annealing of steel castings, the use of a highly refractory glazing as a protective coating to be applied on ordinary firebrick furnace walls, was dealt with. The paper pointed out the directions for improving furnace linings in annealing practice in steel foundries to permit complete exploitation of potential physical characteristics of large cast steel parts by thermal refinement at high temperatures. It also contained a description of a method of coating steel castings for protection against excessive scaling invariably encountered when exposing steel to such high temperatures for long periods.

New Developments in Testing Methods

Several papers on testing methods in various fields of the metal-working industries were presented. Elmer A. Sperry, president of the Sperry Development Co., Inc., Brooklyn, N. Y., and president of the American Society of Mechanical Engineers, dealt with a method of non-destructive internal inspection that has been developed to a point where it is applicable to all metals and alloys. Direct current of high amperage is passed through the specimen and any minute crack or inclusion produces a deviation in the axis of current flow. This deviation is detected and amplified to a value suitable for operating recording equipment.

This electric method of inspection is now in daily use on the railroads of the country, where it is keeping the tracks clear of the menace of internal transverse fissures. The device has been successfully adapted to the inspection of a great variety of parts, such as new rails at the mill, bars, tubes, axles, boiler plate and welded joints.

The American Welding Society Brought Out Important Information on Every Phase of Welding

At the sessions of the American Welding Society, held simultaneously with the convention of the American Society for Steel Treating, the continued rapid expansion of the application of welding became at once apparent. Because of the mass of important material presented before the meeting,

the number of technical sessions had been increased to six. No less than nine research papers were presented, three of them dealing with newly discovered non-destructive methods of testing welds. One of these was the paper by Elmer A. Sperry, already referred to, presented at a joint session; another involved the use of the stethoscope; and the third, the employment of X-ray apparatus in examining welds.

Other papers covered "nitrogen needles," electric welding by the carbon and metallic arcs, special metallographic studies, and stress-strain characteristics of welded joints.

Two papers dealt with the welding of boiler tubes and drums. Other subjects covered included gas welding of steel buildings, automatic welding of thin sheets, welding of pipe lines, replacement of castings by welding in machine construction, and the welding of copper alloys and high-strength aluminum alloys.

The National Metal Exposition Offered Many New Developments of Unusual Interest

In conjunction with the convention of the American Society for Steel Treating, the National Metal Exposition was held in the Public Auditorium and Annex in Cleveland. Meetings of the American Welding Society, of the Institute of Metals Division and of the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, and of the Iron and Steel Division of the American Society of Mechanical Engineers were also held in conjunction with the National Metal Exposition.

In all, there were 250 exhibitors occupying 80,000 square feet of floor space. It would be impossible to speak of all the interesting exhibits, but mention might be made of the unusually complete display of welding machines, including spot welding machines making between 500 and 600 welds per hour. Every branch of the welding machinery industry was represented. Testing machines for almost every purpose in the metal-working field were on display. Very complete exhibits of metal-cutting tools were also a feature of the exhibition, in addition to the extensive exhibits of heat-treating equipment and steel and non-ferrous materials.

* * *

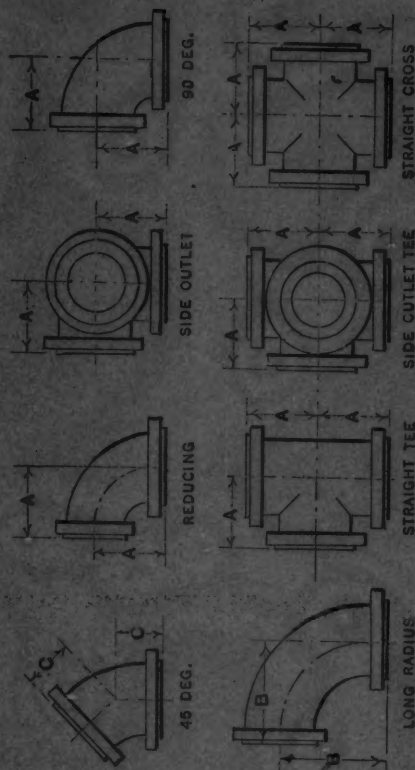
WELDING STRUCTURAL WORK

In an article by Frank P. McKibben, published in the *General Electric Review*, it is mentioned that one of the most notable advances that have been made in electric welding during the past year is in the increased height and size of buildings in which arc welding has been used. The steam power plant of the Chalfonte-Haddon Hall Hotel in Atlantic City, and the new Hotel Homestead, Hot Springs, Va., are electrically welded structures with heights of 150 and 180 feet, respectively. Another interesting development is the comparative ease with which existing steel bridges can be strengthened by welding new steel members to those that may be corroded or over-stressed.

CAST-IRON FLANGED PIPE FITTINGS

For Maximum Working Saturated Steam Pressure of 250 Pounds per Square Inch (Gage)

Approved by the American Standards Association



Nominal Pipe Size	Minimum Inside Diameter of Fitting	Center to Face of Elbow	Center to Face of Long Radius Elbow	Center to Face of 45-deg. Elbow	Diameter of Flange	Thickness of Flange (Min.)	Diameter of Raised Face	Min. Thickness of Body
1	1 1/4	4	5	2 1/2	4 7/8	11/16	2 11/16	1/2
1 1/2	1 1/2	4 1/4	5 1/2	2 3/4	5 1/4	3/4	3 1/16	1/2
2	1 3/4	4 1/2	6	3	6 1/8	7/8	3 9/16	1/2
2 1/2	2	5	6 1/2	3 1/2	6 1/2	1	4 3/16	1/2
3	2 1/4	5 1/4	7	3 3/4	7 1/2	1 1/8	4 15/16	9/16
3 1/2	2 3/4	5 1/2	7 3/4	3 1/2	8 1/4	1 3/8	5 1/16	9/16
4	3	6	8 1/2	4	9	1 3/4	6 15/16	5/8
5	3 1/4	6 1/4	9	4 1/2	10	1 7/8	8 5/16	11/16
6	3 1/2	6 1/2	10 1/4	5	11 1/2	1 7/8	9 11/16	3/4
8	4	7	11 1/2	5 1/2	15	1 7/8	11 15/16	13/16
10	5	8	12 1/2	6	17 1/2	2	14 1/16	15/16
12	6	9	14	7	20 1/2	2 1/8	16 7/16	1
14 O.D.	8	10	16 1/2	8	23	2 3/8	18 15/16	1 1/8
16 O.D.	10	12	19	9 1/2	25 1/2	2 3/4	21 1/16	1 1/4
18 O.D.	12	13	21 1/2	10	28	2 3/4	23 5/16	1 3/8
20 O.D.	14	15	24 1/2	11 1/2	30 1/2	2 3/4	25 9/16	1 1/2
24 O.D.	18	19	29	12	36	3	30 5/16	1 5/8
30 O.D.	23	23 1/2	34	15	43	3	37 3/16	2

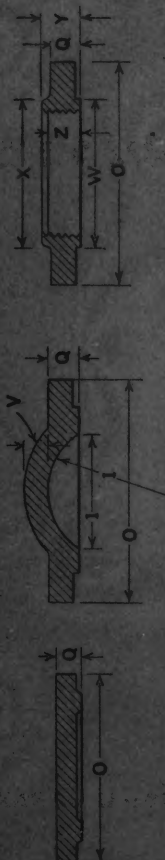
All 250-pound cast-iron standard flanges have a 1/16-inch raised face. This raised face is included in the face to face, center to face, and minimum thickness of flange dimensions.

MACHINERY'S Data Sheet No. 163, New Series, October, 1929

CAST-IRON PIPE FLANGES

Dimensions and Theoretical Weights, in Pounds, of Screwed Companion and Blind Flanges for Maximum Working Saturated Steam Pressure of 250 Pounds per Square Inch (Gage)

Approved by the American Standards Association



Nominal Pipe Size	Diam. of Port		Diam. of Flange	Thickness of Flange (Min.)	Metal Thickness (Min.)	Diam. of Hub (Min.)	Length Through Hub (Min.)	Length of Threads (Min.)	Theoretical Weights (Pounds)	
	I	O							Companion Flanges	Blind Flanges
1	1	4 7/8	11/16	...	...	2 1/16	7/8	0.68	3	3
1 1/4	1 1/4	5 1/4	3/4	...	...	2 1/2	1	0.76	4	4
1 1/2	1 1/2	6 1/8	13/16	...	...	2 3/4	1 1/8	0.87	6	6
2	2	6 1/2	7/8	...	...	3 5/16	1 1/4	1.00	7	8
2 1/2	2 1/2	7 1/2	1	...	...	3 15/16	1 7/16	1.14	11	12
3	3	8 1/4	1 1/8	...	...	4 5/8	1 9/16	1.20	14	16
3 1/2	3 1/2	9	1 3/16	...	...	5 1/4	1 5/8	1.25	18	20
4	4	10	1 1/4	...	...	5 3/4	1 3/4	1.30	23	26
5	5	11	1 3/8	...	...	7	1 7/8	1.41	29	34
6	6	12 1/2	1 7/16	...	...	8 1/8	1 15/16	1.51	37	46
8	8	15	1 5/8	...	...	10 1/4	2 3/16	1.71	56	75
10	10	17 1/2	1 7/8	...	...	12 5/8	2 3/8	1.92	81	120
12	12	20 1/2	2	...	...	14 3/4	2 9/16	2.12	115	155
14 O.D.	13 1/4	23	2 1/8	...	...	16 1/4	2 11/16	2.25	155	210
16 O.D.	15 1/4	25 1/2	2 1/4	...	...	18 3/8	2 7/8	2.45	195	270
18 O.D.	17	28	2 3/8	...	...	20 5/8	2 1/3	2.65	240	350
20 O.D.	19	30 1/2	2 1/2	...	...	22 3/4	3 5/16	2.85	300	440
24 O.D.	23	36	2 3/4	...	...	27 3/8	3 11/16	3.25	450	670
30 O.D.	29	43	3	...	...	...	...	...	...	1070

Cast-iron standard flanges for 250 pounds pressure have a 1/16-inch raised face which is included in the thickness Q.

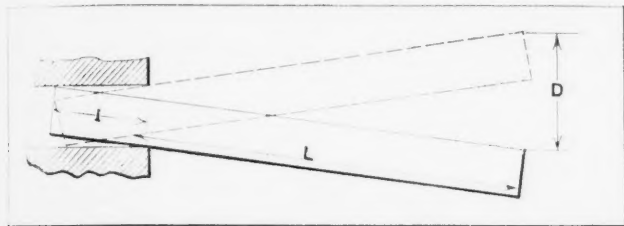
Blind flanges for pipe sizes 10 inches and larger must be dished, with inside radius equal to the port diameter.

MACHINERY'S Data Sheet No. 164, New Series, October, 1929

Shop and Drafting-room Kinks

MEASURING CLEARANCE WITHOUT A MICROMETER

The accompanying illustration shows a method of finding the approximate amount of clearance



Makeshift Method for Finding Bearing Clearance

between a shaft and its bearing. One end of the shaft is inserted in the bearing a known distance I , and the other end is moved up and down to its extreme positions, the movement D being measured. By multiplying the distance D by the inserted distance I , and dividing the product by twice the protruding length L of the shaft, a quotient is found which will be the approximate difference between the diameters of the shaft and bearing. While this method is an approximation only, it can be used as a makeshift where micrometers are not available.

W. F. SCHAPHORST

Newark, N. J.

DRAWING PERPENDICULARS

A 45-degree triangle can be conveniently employed for drawing perpendiculars to angular lines if a fine line is scribed through the points A and B , as indicated in the accompanying illustration. The line must, of course, be accurately scribed at right angles with the long side of the triangle. With the scribed line coinciding with the angular line, a perpendicular such as AC or AD can be erected at any desired point.

Evansville, Ind.

R. M. KOCH

FINDING SCALE GRADUATIONS QUICKLY

There are various methods for conveniently finding the desired scale on a triangular rule. One way is to place a paper clamp on the middle of the rule, so as to recognize the relative position of the scale. This does not permit the rule to be held firmly except at the ends, and it is often necessary to shift the clamp, as it interferes with the reading of the scale. A method that the writer has found convenient is to place a rubber band on the rule, stretching it from end to end and encircling the

edges of the scale to be used. When picking up the rule for use, it is only necessary to look at an end and turn that edge of the triangle that is enclosed by the rubber band uppermost. This brings four scale markings to view, one of which is the scale required.

Brooklyn, N. Y.

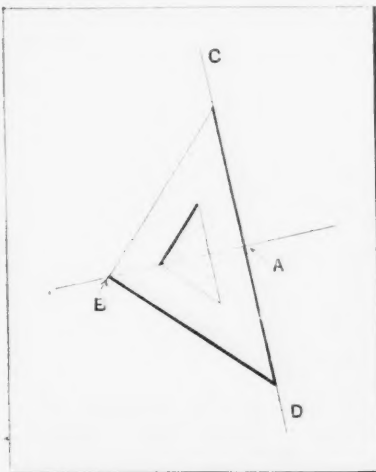
MURRAY R. MANTELMAN

OILSTONE LUBRICANT

Where an oilstone is used for producing a very smooth finish on cutting tools, lard oil is usually employed as a lubricant for the stone. The writer has found that a much better finish can be obtained if a mixture of three parts of glycerine and one part of alcohol is applied to the stone instead.

Brentford, England

W. E. WARNER



Method of Using Triangle to Draw Perpendiculars

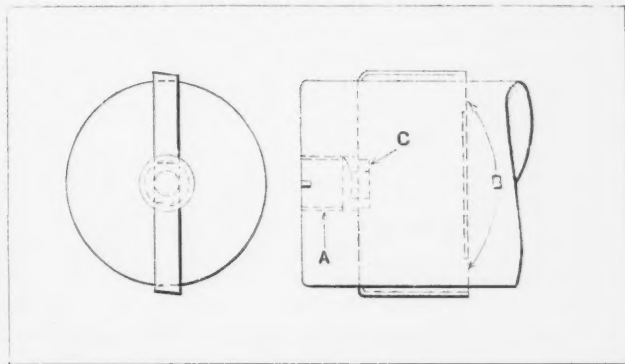
FLOATING REAMER CONSTRUCTION

The usual method of making a floating reamer-blade holder is to cut a rectangular slot for the blade through the side of the bar, the slot being first drilled out and then finish-machined with a slotting tool; with this method it is generally necessary to square up the slot by hand-filing.

With the design shown in the illustration, it is only necessary to run a plain milling cutter through the end of the bar to produce an accurate slot for the blade. The screw A , which has a diameter of twice the width of the slot, keeps the bottom of the blade square against the bottom of the slot at B , while the turned end of the screw fitting in a groove C prevents the latter from dropping out of the slot while the reamer is not in operation.

Fairfield, Conn.

J. E. FENNO



Floating Reamer-blade Holder with Open-end Slot Construction

Possibilities of High-Strength Cast Iron*

The Mere Addition of Alloy Metals to an Inferior Base Material is not Sufficient to Produce the Better Grades of High-strength Cast Iron

By E. J. LOWRY, Consulting Engineer, Detroit, Mich.

THE methods of producing a high-strength cast iron are receiving great attention in the foundry industry at the present time. European investigators have perhaps paid more attention to the development of this material than our own research and production men. This is probably due to the fact that in this country we are faced with the problem of mass production, whereas in Europe it has been possible to give more time to the technical development of processes for the production of cast iron having better physical properties.

The American foundryman is confronted with the necessity of producing castings in large quantities and big tonnages. He, therefore, cannot consider high-strength castings without giving careful thought to his present processes. It is also true that our present machine shop methods, involving high speeds and feeds, do not lend themselves to the machining of the "high-test" cast irons now being developed; hence, the apparent lack of interest on the part of American foundrymen in these new developments.

Special Melting Processes, as Well as the Addition of Alloy Metals, are Required for Obtaining the Best High-strength Cast Iron

The production of high-strength cast iron by the use of alloy metals has long been known, but special melting processes as well as the addition of alloy metals are necessary to produce strengths of from 60,000 to 65,000 pounds per square inch. On account of the special melting processes required, these methods have not generally been accepted by foundrymen. It must be realized that a complete change in melting methods involves a serious proposition in the foundry, whereas a simple method for introducing an alloy metal could be generally accepted.

It has been believed by many that alloy metals may be introduced into inferior irons to obtain a high-strength cast iron. This is not the case. Alloy metals alone will not produce such results. They will act as an aid in improving an unfavorable condition, but the full value of the alloy metal is not obtained in that way.

However, when alloys are properly used in connection with the correct section of the casting and the correct analysis of the cast iron itself, it becomes possible to produce high-strength cast iron without the use of a special melting process. In

this way it is possible to increase the strength of cast iron to from 28,000 pounds to 45,000 pounds per square inch, and cast iron with a strength as high as 65,000 pounds per square inch has been produced. The alloy metals are nickel, chromium, molybdenum, vanadium, and titanium. They may be used either singly or in varying combinations with each other. As an example, the following analyses are given:

	Chromium-Nickel, Per Cent	Chromium-Molybdenum, Per Cent
Total Carbon	3.34	3.42
Combined Carbon	0.62	0.54
Manganese	0.56	0.59
Silicon	2.49	2.49
Chromium	0.50	0.36
Nickel	1.07	....
Molybdenum	....	0.31
Sulphur	0.096	0.075
Phosphorus	0.142	0.135

Two irons of the analyses given were cast on the same day using the same original metal mixture, the only variations being in the addition of alloy metal in the ladle. The following physical properties were obtained:

Chromium-nickel Cast Iron

Transverse Strength	3366 to 3852 pounds per square inch
Tensile Strength	33,203 to 33,313 pounds per square inch
Brinell Hardness	217 to 223
Depth of Chill	5/32 to 3/16 inch

Chromium-molybdenum Cast Iron

Transverse Strength	3151 to 3365 pounds per square inch
Tensile Strength	32,686 to 32,994 pounds per square inch
Brinell Hardness	207 to 217
Depth of Chill	7/32 to 1/4 inch

Vanadium has come into considerable use in the production of automotive forming dies. About 0.15 per cent of vanadium is used together with nickel, chromium, and molybdenum in small percentages. The effect of this combination is to give increased wearing qualities combined with high strength and excellent machining properties.

The Effect of Annealing on High-strength Cast Iron

The question of annealing should be considered in connection with the machining properties of high-strength cast iron. Annealing will make it possible to produce a harder and stronger casting, but the proper kind of annealing for castings of this kind should affect hardness and strength but little, as the object is to make them easy to machine—practically as easy as the ordinary softer cast irons. A test was made with two cast irons of the following compositions:

*Abstract of a paper read before the convention of the American Society for Steel Treating at Cleveland, September 9-13.

	Regular Iron, Per Cent	High-strength Iron, Per Cent
Total Carbon	3.30	3.35
Combined Carbon	0.42	0.64
Manganese	0.63	0.55
Silicon	2.26	1.70
Chromium	0.08	0.63
Nickel	0.21	
Molybdenum		0.75
Phosphorus	0.231	0.206
Sulphur	0.104	0.064

The physical properties of the resulting castings were as follows:

Regular Cast Iron

Transverse Strength 3099 pounds per square inch
Brinell Hardness 207
Tensile Strength 25,308 pounds per square inch

High-strength Cast Iron

Transverse Strength 5459 pounds per square inch
Brinell Hardness 321
Tensile Strength 46,039 pounds per square inch

A study of these figures will show that the tensile and transverse strengths of the high-strength

cast iron are about 75 per cent greater than for regular iron. The hardness is about 50 per cent greater, and so also is the deflection.

Annealing the high-strength cast iron at 950 degrees F. for four hours, and subsequently cooling it in the furnace, makes it easily machineable. The tensile strength is reduced to 42,850 pounds per square inch, a comparatively small amount. Undoubtedly, if the regular cast iron were annealed to relieve strains, it would also improve its machining properties to some extent.

In conclusion, high-strength cast irons offer possibilities to the gray iron foundryman, not only to increase the field of application of the castings that he can produce, but also to regain some of the kinds of work which are now being made from steel castings. However, high-strength cast iron is still in the experimental stage and during this development period it will be necessary to classify or grade all cast iron according to its physical properties and other merits.

What is the Most Ingenious Mechanism You Have Seen?

MACHINERY offers seventeen prizes for the seventeen best articles on ingenious mechanisms, each article to be confined to one mechanism or mechanical movement.

One prize—\$100	} in addition to regular space rates
Two prizes—each, \$50	
Four prizes—each, \$25	
Ten prizes—each, \$10	

MACHINERY'S regular space rates will be paid not only for the prize-winning articles, but also for any articles accepted for publication that may not receive a prize.

Each contestant may send as many articles as he wishes. All will be entered in the competition and all may be accepted for publication; but no contestant will be awarded more than one prize.

Articles entered in this competition should be addressed to the Editor of MACHINERY, 148 Lafayette St., New York City. They must be mailed on or before November 15.

Preparing Articles for the Competition

This competition applies to any kind of mechanism making use of a practical and ingenious mechanical motion or principle. The competition is open to all, whether subscribers to MACHINERY or not. The general procedure is very simple.

1. Send a drawing of the mechanism (or photograph, if preferred—or both) that clearly shows all important parts of the particular movement to be described.

2. Describe as clearly as possible both the *purpose* of the mechanism and its *action*—*what* it does and *how* it does it. Describe the purpose first, and the means of accomplishing it afterwards.

3. Mark the important parts on the drawing, such as levers, cams, etc., with letters, A, B, etc.,

and use corresponding letters to identify those parts in the description; thus: "Lever A is operated by cam B." This will help to make the description readily understood, and will tie together the drawing and the text.

4. Confine each article to a description of a single mechanism or mechanical movement. Do not attempt to describe the entire machine of which the mechanism or movement is a part. Omit as far as possible reference to parts of the machine that do not affect the movement being described. Clear descriptions of separate mechanisms, rather than descriptions of entire machines, are desired.

Suggestions about Illustrations and Manuscripts

Clear blueprints or pencil drawings with distinct lines are satisfactory. They should be made on separate sheets of paper. Send only drawings that are "to scale," with the various parts shown in correct relationship and proportion. Rough free-hand sketches cannot be used. The drawing must show the assembled mechanism, although a diagram, or a drawing that is partly diagrammatic, may often be substituted to advantage, especially if it more clearly illustrates the arrangement of a complicated mechanism.

It is more essential that important facts be clearly stated than that the manuscript be neatly written; but carefully prepared manuscripts usually indicate careful thought.

Do not describe mechanisms that are familiar to most designers; descriptions of movements that are generally known cannot be accepted, even though they may be very ingenious. On the other hand, it is immaterial how long ago a mechanism or movement was originally designed, provided it has not previously been described in any publication or text-book.

OBITUARIES

JOHN DAVID HURLEY

John David Hurley, president and founder of the Independent Pneumatic Tool Co., Chicago, Ill., died suddenly on August 15 at his home at the Edgewater Beach Hotel in Chicago.

Mr. Hurley was born in Simsbury, Conn. While he was still a child his parents moved to Galesburg, Ill., where he received his education. Coming from a family who had long been identified with railroad work, he entered this field after leaving school, being first employed with the Chicago, Burlington & Quincy Railway. Later he took an active part in the building of railroads in Mexico.



In 1898 he organized the Standard Pneumatic Tool Co., together with his brother Edward N. Hurley, Sr. This was one of the first concerns to introduce pneumatic tools in railroad shops and other industries. In 1902 this company was absorbed by the Schwab

interests, and Mr. Hurley became connected with the Rand Drill Co. of New York. In 1905 he returned to Chicago and organized the Independent Pneumatic Tool Co., which under his leadership has become an important factor in the pneumatic and electrical tool field.

Mr. Hurley is survived by his widow, Mary Ferris Hurley, and by a sister and three brothers.

GEORGE W. THOMSON, midwest district manager of the Norton Co., Worcester, Mass., died Thursday, August 22, in Chicago, after a brief illness. He had been with the Norton Co. for thirty-one years, serving successively as head of the billing department, salesman in Connecticut and Philadelphia, and since 1915 as district manager of the grinding wheel division, with headquarters at Chicago.

PERSONALS

H. V. ERBEN has been appointed manager of the apparatus division of the central station department of the General Electric Co., Schenectady, N. Y.

ANDREW YATSKO has been appointed general superintendent of the Oakland, Calif., works of the General Electric Co. to succeed J. R. AUGUSTON, who has resigned.

F. C. HOSIMER has been transferred from the St. Louis office of the Wagner Electric Corporation to the Chicago branch sales office where he will represent the company as a salesman.

E. J. SCHWANHAUSSER, for the last two years assistant manager of the Harrison Works of the Worthington Pump & Machinery Corporation, has been appointed manager of that company's Buffalo works. Mr. Schwanhausser has been connected with the company since 1912 while he was still a student at Stevens Institute of Technology.

FRED M. CROSS, manager of the Ingersoll-Rand Co.'s pneumatic tool sales department for the Chicago office, has been appointed assistant general manager of pneumatic tool sales, and will be located at the headquarters of the company at 11 Broadway, New York City. D. W. ZIMMERMAN will succeed Mr. Cross as manager of pneumatic tool sales for the Chicago office.

I. F. BAKER was recently appointed European sales manager of the Westinghouse Electric International Co. and will

have his headquarters at 2 Norfolk St., Strand, London. Until his recent appointment, he was power division sales manager of the Westinghouse Electric International Co. with offices in New York, and previous to that, was managing director of the Westinghouse Electric Co. of Japan.

WALLACE S. CLARK, manager of the cable division of the central station department of the General Electric Co., Schenectady, N. Y., has resigned and F. H. WINKLEY has been appointed manager of the consolidated lighting and cable division in the same department. Mr. Clark is being relieved of detail work and executive management of the cable division, so that he may devote more of his time to special negotiations and general consulting work. He will be general consultant in the cable section.

J. F. LINCOLN, president of the Lincoln Electric Co., Cleveland, Ohio, recently sailed on the *Leviathan* for London, England, where he will have charge of a demonstration for European engineers of the electronic-tornado process of carbon arc-welding which, since its inception, has revolutionized the method of automatic welding in this country. The demonstration will take place at the Allen Liversidge plant, and is being given in response to numerous requests from engineers and manufacturers in all parts of Europe.

WILLIAM MCPHERSON, dean of the department of chemistry in Ohio State University, was elected president of the American Chemical Society for 1930 in a special election. Professor McPherson succeeds Dr. Irving Langmuir of Schenectady, N. Y., assistant director of research of the General Electric Co. Professor McPherson was named president by ballot of the society's council to take the place of Professor Samuel W. Parr of the University of Illinois, who had been chosen for this post at the last regular election but who was unable to serve.

* * *

TRADE NOTES

REED-PRENTICE CORPORATION, Worcester, Mass., manufacturer of machine tools, has just let a contract for an addition to its plant of 150 by 60 feet, to take care of the expansion in its business and to give additional space to the assembly floor.

POMONA PUMP CO., Pomona, Cal., announces that the company is planning to construct additional factory buildings and to install additional pump building machinery in order to take care of its constantly increasing business. The plant is now operating three shifts per day.

DODGE MFG. CORPORATION, Mishawaka, Ind., manufacturer of power-transmitting, material-handling, and special equipment announces the appointment of E. S. Grant as general sales manager. Mr. Grant was formerly assistant general sales manager in charge of the eastern district.

ROME IRON MILLS, INC., announce that their plant at Rome, N. Y., has been leased to the Wrought Iron Co. of America. The organization has been retained and the Wrought Iron Co. of America proposes to continue to make the same quality of iron as has been produced in the past.

DEMCO DRILLING MACHINE CO., 6616 Morgan Ave., Cleveland, Ohio, a division of the Merit Equipment Corporation, has appointed the Commercial Tool Co. of Cleveland, exclusive agents for the Cleveland territory for the company's line of Demco high-speed sensitive drilling machines.

CLEVELAND TWIST DRILL CO., Cleveland, Ohio, received by the *Graf Zeppelin* from B. P. Sweeny, the company's representative in Japan, a letter mailed in Tokio August 21, which was delivered in Cleveland August 30, nine days later. Under ordinary circumstances mail from Japan reaches Cleveland in approximately four weeks.

CHAIN BELT CO., Milwaukee, Wis., manufacturer of Rex deep well oil chains, conveyors, and concrete mixers, announces that the Houston, Texas, office of the company has been moved from its former location at 1000 Marine Bank Building to larger quarters at 1310 Second National Bank Building. Russell G. Davis is manager of the Houston office.



EXPOSITION NUMBER



STOP

at SPACE 1W17, Cleveland Public Auditorium

September 30th - October 4th

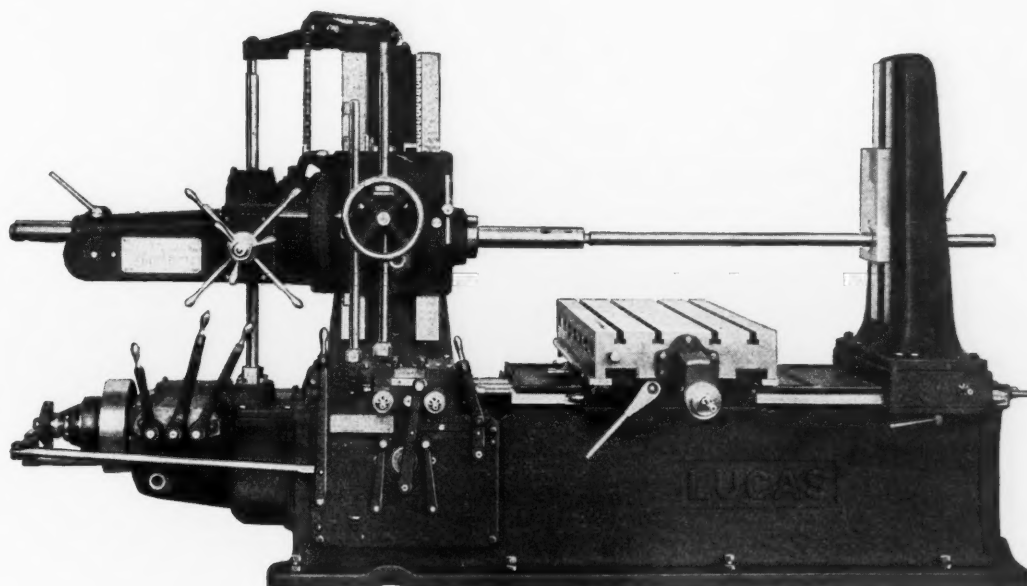
NATIONAL MACHINE TOOL BUILDERS'
EXPOSITION

LOOK

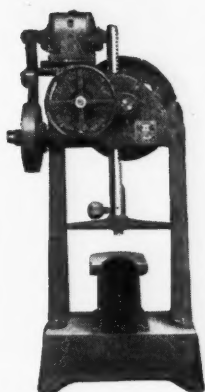
at the NEW MODEL LUCAS "Precision"
HORIZONTAL BORING MACHINES

LISTEN

to an explanation of their many
advantages and exclusive features.



The LUCAS
Power Forcing Press
will also be exhibited.



Visit the shop
where these machines
are made, at

THE LUCAS MACHINE TOOL CO.,

**523 East 99th Street
CLEVELAND, OHIO**

FOREIGN AGENTS: Allied Machinery Co., Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm, R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co., Tokyo. Ing. M. Kocian & G. Nedela, Prague. Emanuele Mascherpa, Milan, Italy.

GENERAL ELECTRIC Co., Schenectady, N. Y., announces that the fourteen wholesale distributing corporations owned by the company will be consolidated into the GENERAL ELECTRIC SUPPLY CORPORATION (of Delaware). The plan involves no change of ownership. Gerard Swope will serve as chairman of the board, and C. E. Patterson, as president and director.

MCINTOSH & MERRILL MACHINE Co., 4909 Luther Ave., Cleveland, Ohio, has been organized for the purpose of doing general machinery contract work and for the building of special machinery to order. A. T. Merrill is president of the company. For the past ten years Mr. Merrill has been with the Carey Machine Co. in the capacity of superintendent.

DOMESTIC ELECTRIC Co., Cleveland, Ohio, a division of Black & Decker Mfg. Co., Towson, Md., has purchased a group of buildings and a tract of land at Kent, Ohio, to be devoted solely to the manufacture of fractional horsepower motors of the universal type. The group of buildings comprises office and factory space, and will more than double the present capacity of the company.

WAGNER ELECTRIC CORPORATION, 6400 Plymouth Ave., St. Louis, Mo., announces that Ralph R. Rugheimer is now a member of the Atlanta branch sales office of the company. Mr. Rugheimer has spent several years in construction and central station work and has also been 5 1/2 years with the Westinghouse Electric & Mfg. Co. He is a graduate of Westberry College, South Carolina, in electrical engineering.

INGERSOLL-RAND Co., 11 Broadway, New York City, informs us of the increasing use of oil-electric locomotives. The American Rolling Mill Co. has just ordered two more 300-horsepower oil-electric locomotives for use in their Ashland,

Ky., plant. These will be duplicates of four locomotives already in service at this plant. They are built jointly by the Ingersoll-Rand Co., the General Electric Co., and the American Locomotive Co.

DIAMOND CHAIN & MFG. Co., 417 Kentucky Ave., Indianapolis, Ind., has just completed an extension to its plant and erected a new four-story office and administration building of complete fireproof construction. The offices occupy the entire top floor, and the engineering and drafting departments, the third floor. The two lower floors are used as a factory extension, while the space formerly occupied by office, engineering, and drafting departments has also been converted to manufacturing use; a new building is employed for steel storage. The increased demand for the company's product has made this addition of 40,000 square feet of factory capacity necessary.

CONTINENTAL AIRCRAFT ENGINE Co. has been organized as a subsidiary to the Continental Motors Corporation for the purpose of manufacturing and developing aircraft engines. This subsidiary will have a separate official staff, consisting of the following: President, W. R. Angell, Continental Motors Corporation; vice-president, Robert Insley, who has been in charge of the development work; treasurer, R. M. Sloane, treasurer of Continental Motors Corporation; and secretary, W. C. Keith, assistant secretary of the parent organization. The Continental Aircraft Engine Co. will utilize the facilities of the parent company. The production will be carried on at the Detroit plant, which is located near the Detroit city airport, offering exceptional facilities for testing engines in flight.

COMING EVENTS

SEPTEMBER 30-OCTOBER 2—Eighth annual convention of the National Industrial Advertisers Association in Cincinnati, Ohio. Chairman of the Convention Committee, Jesse R. Harlan, advertising and sales manager of the Stuebing-Cowan Co., Cincinnati, Ohio.

SEPTEMBER 30-OCTOBER 4—Machine Tool Exposition held by the National Machine Tool Builders' Association in the Public Auditorium, Cleveland, Ohio. Ernest F. DuBrul, general manager, 1415 Enquirer Building, Cincinnati, Ohio.

SEPTEMBER 30-OCTOBER 4—Machine Tool Congress to be held in Cleveland, Ohio, jointly with the Production Meeting of the Society of Automotive Engineers and the Machine Shop Practice Division Meeting of the American Society of Mechanical Engineers. For further information, address E. F. DuBrul, National Machine Tool Builders' Association, 1415 Enquirer Building, Cincinnati, Ohio.

OCTOBER 2-4—Production meeting of the Society of Automotive Engineers to be held at Hotel Cleveland, Cleveland, Ohio. Coker F. Clarkson, secretary, 29 W. 39th St., New York.

OCTOBER 7-10—Annual meeting of the National Electrical Manufacturers Association at the Wardman Park Hotel, Washington, D. C. For further information, address Albert Pfaltz, National Electrical Manufacturers Association, 420 Lexington Ave., New York City.

OCTOBER 7-12—First National Electrical Exposition to be held at the Grand Central Palace, New York City, under the joint auspices of the Electrical Board of Trade of New York and the New York Electric League. For further information, address E. F. Korb, 441 Lexington Ave., New York City.

OCTOBER 16—Annual meeting of the Gray Iron Institute at Hotel Cleveland, Cleveland, Ohio. Arthur J. Tuscany, manager, Terminal Tower Building, Cleveland, Ohio.

OCTOBER 21-23—Meeting of the American Society of Mechanical Engineers at Akron, Ohio; headquarters, Portage Hotel. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

OCTOBER 23-25—Sixteenth National Convention of the Society of Industrial Engineers at the Hotel Statler, Cleveland, Ohio. Further information may be obtained from the Society of Industrial Engineers, 205 W. Wacker Drive, Chicago, Ill.

OCTOBER 24-26—Semi-annual meeting of the American Gear Manufacturers' Association at the Benjamin Franklin Hotel, Philadelphia, Pa., T. W. Owen, Secretary, 3608 Euclid Ave. Cleveland, Ohio.

DECEMBER 2-6—Annual meeting of the American Society of Mechanical Engineers at the Engineering Societies Building, 29 W. 39th St., New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

SOCIETIES, SCHOOLS AND COLLEGES

TEMPLE UNIVERSITY, Philadelphia, Pa. Annual catalogue for 1929, containing calendar, outline of courses, and other pertinent data.

OHIO MECHANICS INSTITUTE, Central Parkway and Walnut St., Cincinnati, Ohio. Bulletin announcing the evening classes for 1929-1930.

COLUMBIA UNIVERSITY, Morningside Heights, New York City. Bulletin of the university afternoon and evening classes in business for the year 1929-1930.

UNIVERSITY OF UTAH, Salt Lake City, Utah. Catalogue for 1929-1930, containing calendar, outline of courses, and other information relating to the university.

NATIONAL SAFETY COUNCIL, 108 E. Ohio St., Chicago, Ill. Safe Practices Pamphlet No. 35, describing safety equipment used on conveyors and other safety provisions connected with the use of conveyors.

POLYTECHNIC INSTITUTE OF BROOKLYN, 99 Livingston St., Brooklyn, N. Y. Bulletin of the evening session for 1929-1930, covering courses in chemical, civil, electrical, and mechanical engineering, chemistry, mathematics, physics, history, economics, and languages.

NEW BOOKS AND PAMPHLETS

AMERICAN STANDARDS YEAR BOOK FOR 1929. 88 pages, 7 3/4 by 10 1/2 inches. Published by the American Standards Association, 29 W. 39th St., New York City.

INDUSTRIAL EYE HAZARDS—Health Practices Pamphlet No. 6. 8 pages, 8 1/2 by 11 inches. Published by the National Safety Council, 108 E. Ohio St., Chicago, Ill.

HEALTH SUPERVISION IN INDUSTRY. 8 pages, 8 1/2 by 11 inches. Published by the National Safety Council, 108 E. Ohio St., Chicago, Ill., as No. 5 of a series of health practices pamphlets.

ABSTRACTS OF SCIENTIFIC AND TECHNICAL PUBLICATIONS FROM THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY. 75 pages, 6 by 9 inches. Published by the Massachusetts Institute of Technology, Cambridge, Mass.

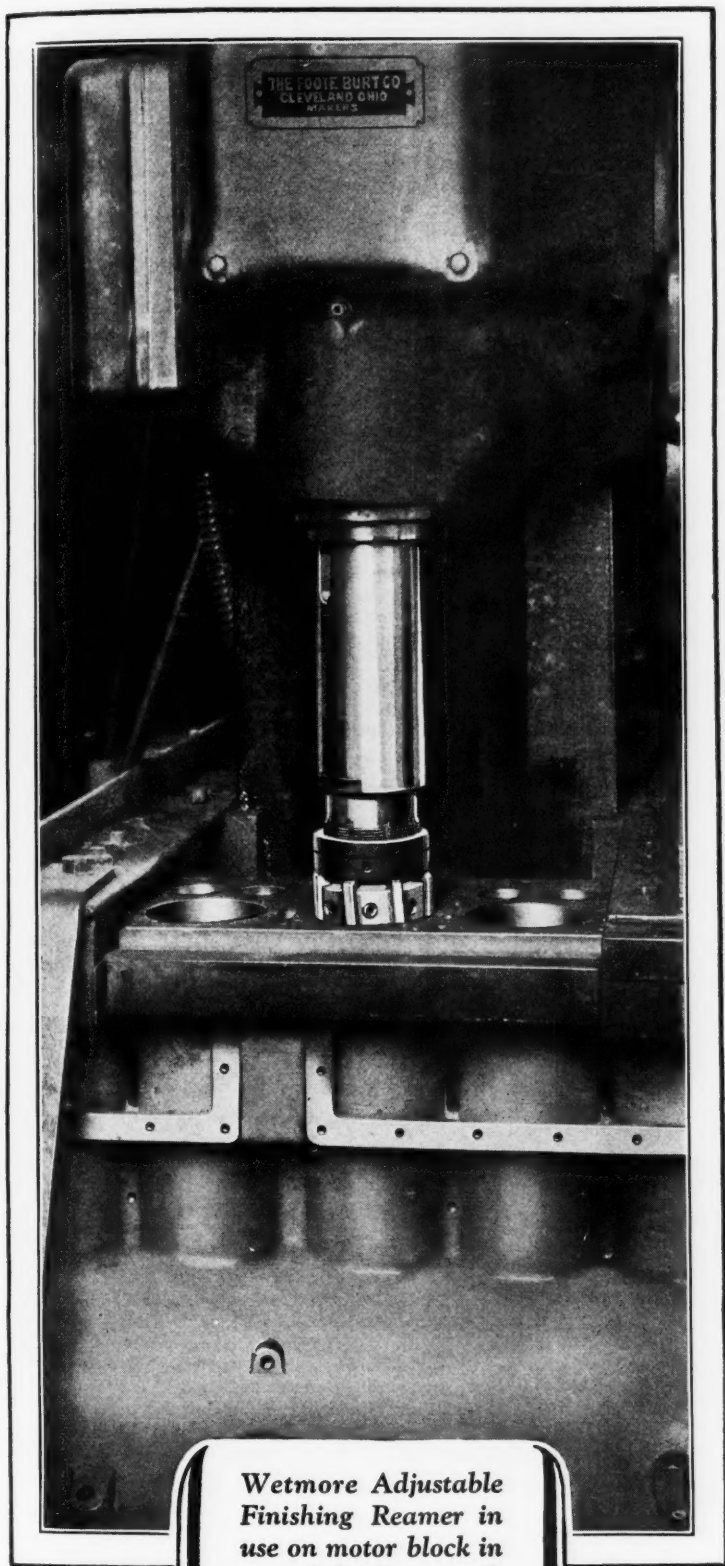
BEARING BRONZES WITH AND WITHOUT ZINC. By H. J. French and E. M. Staples. 22 pages, 6 by 9 inches. Published by the Department of Commerce, Washington, D. C., as Research Paper No. 68 of the Bureau of Standards. Price, 15 cents.

THE CONNECTICUT UNIVERSAL ANGLE VISE-PLATE. 26 pages, 3 1/2 by 5 3/4 inches. Distributed by N. W. Ordway & Son, Hartford, Conn. Price, 35 cents.

This little pamphlet contains tables for angular indexing applicable to Brown & Sharpe and Cincinnati index-plates.

AERIAL NAVIGATION AND METEOROLOGY. By Captain Lewis A. Yancey. 316 pages, 6 by 9 inches. Published by the Norman W. Henley Publishing Co., 2 W. 45th St., New York City. Price, \$4.

This book is intended to serve as a manual for aircraft pilots and navigation students, and for reference. It is a comprehensive treatise written in simple non-technical language. The author, who has had fifteen years' experience as a practical navigator, attracted the attention of the world, it will be remembered, by his flight from Old Orchard, Me., to Rome, Italy.



Wetmore Adjustable Finishing Reamer in use on motor block in one of the large, well-known Detroit automobile plants.

Why the Big Motor Manufacturers *prefer the* WETMORE

THERE are several reasons why many of the largest automobile manufacturers in Detroit and other cities use Wetmore Adjustable Cylinder Reamers as standard equipment.

These manufacturers know by tests and comparisons that the Wetmore has *greater durability*, due to its sturdier construction. Also that it permits a *faster working speed*, with *no vibration*.

Wetmore Cylinder Reamer Sets (Roughing reamer, Semi-finishing reamer, Finishing reamer) are built for strenuous service. Their long life means economy. The Roughing reamer is extremely rugged. The Semi-finishing reamer, with its left-hand angle blades, eliminates digging in and chattering. It assures a straight, round hole with no scoring. The construction of the Finishing reamer assures a smooth, glass-like finish to the cylinder wall.

Give Wetmore Cylinder Reamers a trial in your shop. Compare them on a production and economy basis with any other reamers. They will prove their superiorities to you, just as they have to others.

Send for Catalog No. 29, showing full line of Wetmore Adjustable Reamers, including standard, heavy-duty, shell, small machine and cylinder reamers. Also arbors and replacement blades.

WETMORE REAMER COMPANY
60-27th Street Milwaukee, Wis.



ADJUSTABLE REAMERS

"THE BETTER REAMER"

The book deals with bearing and direction, the compass, correction of courses, meteorology, and first aid. It contains a solution of numerous problems and examples from practice.

PRACTICAL TREATISE ON GEARING. 243 pages. Published by the Brown & Sharpe Mfg. Co., Providence, R. I. Price, cloth-bound, \$1.50; paper-bound, \$1.

This is a new edition of a book containing data on gearing, primarily intended for the use of shop men. In the present edition considerable new material has been presented, including a discussion of the 14½-degree composite system and the conjugate rack. Material on straight tooth and spiral bevel gears, in accordance with the Gleason Works system, has been added, as well as information on generating spur and spiral gears by the hobbing method. The chapter on the strength of gears has been enlarged to include both metallic and non-metallic gears. Various useful tables, including tables of trigonometric functions and natural sines and cosines from 0 to 90 degrees, are given.

THE OXY-ACETYLENE WELDER'S HANDBOOK. By M. S. Hendricks. 208 pages, 4¼ by 6½ inches; 102 illustrations. Published by the Acetylene Journal Publishing Co., 608 S. Dearborn St., Chicago, Ill. Price, \$3.

This book comprises a working manual of instructions for oxy-acetylene welders. The important operating factors involved in welding are discussed, principally from the standpoint of welding on steel, apparently because that is the metal that is most commonly welded. However, the book also contains information regarding the welding of other ordinary metals, such as cast iron, aluminum, copper, brass, bronze, nickel, monel metal, and alloy steels. There are also a number of special fields for welding, such as pipe welding, tank welding, aircraft welding, etc., which are discussed. The table of contents includes: The welding gases; welding equipment; setting up equipment; methods of welding; preparation for welding; inspecting the weld; training operators; welding properties of common metals; testing; and important applications.

REPORT WRITING. By Carl G. Gaum and Harold F. Graves. 319 pages, 6 by 9 inches; numerous forms and charts. Published by Prentice-Hall, Inc., New York City. Price, \$5.

The necessity for comprehensive reports in the conduct of the industries of today carries with it a new demand for the proper preparation of such reports. The present book will prove an aid to those who are required to present reports on industrial and business subjects of a wide variety. The book is written with the view of training the reader in the essential qualities of report writing and emphasizes the need for accuracy, thoroughness, conciseness, proper emphasis, and attractive appearance. Numerous examples are included showing how reports on different subjects should be prepared. Among the specific reports dealt with are periodic reports to executive officers, progress reports, examination and investigation reports, and recommendation reports. The book also contains a bibliography of books and publications useful to the report writer, a list of business and technical periodicals, and a bibliography of published reports.

VIELSCHNITTBANKE, IHRE KONSTRUKTION UND ARBEIT (Multi-cut Lathes, Their Construction and Operation). By Max Kurrein. 114 pages, 7 by 10 inches; 164 illustrations. Published by Guido Hackebell A.-G., Berlin SW 68, Germany. Price, 15 RM.

The author of this book, which is at present available in German only, is professor at the Technical Institute at Charlottenburg, and is also chief engineer of the testing and experimental work for machine tools at this institute.

The book contains detailed descriptions, with halftone illustrations and cross-section line engravings, of all the leading types of multi-cut and automatic lathes produced both in this country and abroad. It also deals in detail with the different methods used for holding the work and the tools and applying the cutting tool to the work. In describing the construction of the machines, each of the important elements is thoroughly covered, as, for example, the drive, the frame or bed, the tool and work supports, the feed arrangements, and the work- and tool-spindles. The section dealing more specifically with the work- and tool-holding devices and the operation of the machines, gives attention to the turning of shafts, camshafts, gear blanks, pistons, crankshafts, hubs of different shapes, and similar machine parts. The great number of line engravings aids materially in making the subject matter clear and complete.

A B C OF TELEVISION. By Raymond Francis Yates. 210 pages, 6 by 9 inches; 78 illustrations. Published by the Norman W. Henley Publishing Co., New York City. Price, \$3.

This is a comprehensive treatise on the theory, construction, and operation of telephotographic and television transmitters and receivers, prepared especially for home experimenters and students of television. It includes a brief history of the subject and also gives the reader a glimpse into the future. It explains in easily understood language the theory of photo-electric cells, scanning disks, neon tubes, Kerr cells, selenium cells, and the underlying factors involved in the successful transmission of pictures and living scenes by radio. The various television and telephotographic systems in use today are outlined, and a brief description is given of how to build and use simple homemade equipment. The author is well qualified for the preparation of such a volume, having been formerly editor of *Popular Radio*. He is also a member of the Institute of Radio Engineers and of the American Physical Society. In the preparation of the volume he has been aided by material furnished him by the courtesy of the Bell Telephone Laboratories. In this work, the author has sought to present only such data as would answer the questions and solve the problems of practical-minded experimenters who desire to assemble their own television and telephotographic machines.

NEW CATALOGUES AND CIRCULARS

BOILERS. Erie City Iron Works, Erie, Pa. Booklets illustrating and describing Erie City "Three-drum" boilers and Erie City "Economic" boilers.

ELECTRIC EQUIPMENT. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Circular 1852 on oil circuit-breakers for medium interrupting capacity usage.

PORTABLE ELEVATORS. Revolver Co., 336-352 Garfield Ave., Jersey City, N. J. Bulletin 91C, illustrating and describing the Red Giant model M electric portable elevator.

SPEED REDUCERS. Westinghouse Electric & Mfg. Co., Nuttall Works, Pittsburgh, Pa. Circular 1856, descriptive of bedplates for types SVR and DVR Westinghouse-Nuttall speed reducers.

GEAR-HOBGING MACHINES. Brown & Sharpe Mfg. Co., Providence, R. I. Catalogue descriptive of the new features of the improved Brown & Sharpe No. 34 gear-hobbing machine of motor-in-base design.

ELECTRIC HEATING EQUIPMENT. Public Service Co. of Northern Illinois, 72 W. Adams St., Chicago, Ill. Booklet containing a great many examples of the application of electric heat to industrial operations.

BLUEPRINTING EQUIPMENT. Shaw Blue Print Machine Co., Inc., Newark, N. J. Cata-

logue illustrating and describing the Shaw horizontal blueprint, the Shaw wringer and dryer, and the Shaw upright or vertical blueprint.

MATERIAL HANDLING EQUIPMENT. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular illustrating and describing Cleveland tramrails in use in the ceramic industry.

SHIPPING ROOM EQUIPMENT. Gerrard Co., Inc., 1942 S. 52nd St., Chicago, Ill. Catalogue illustrating and describing the application of the Gerrard No. TA wire tying machine for use in tying up packages for shipment with metal wire.

ELECTRIC GENERATORS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet 20355-A, covering type ES engine-driven alternating-current synchronous generators. Leaflet 3746-B, covering synchronous motor generators.

RIVETING MACHINERY. Hanna Engineering Works, 1763 Elston Ave., Chicago, Ill. Circular illustrating and describing the Hanna rapid turret riveter and the Hanna yoke riveter with rotating stake and mounted on a radially rolling stand.

ELECTRIC INSTRUMENTS. Roller-Smith Co., 233 Broadway, New York City. Bulletin No. 810, illustrating and describing thermocouple ammeters and milli-ammeters for use on direct current and alternating current of any frequency, including radio frequency.

ELECTRIC STEEL CASTINGS. Racine Steel Castings Co., 250-15th St., Racine, Wis. Booklet on the application and production of basic electric steel castings. The facilities for making electric steel castings are illustrated and described, and points on the effective use of steel castings are given, illustrated by actual examples.

HEATING EQUIPMENT. American Blower Corporation, Detroit, Mich. Bulletin No. 7818 entitled "Venturafin Method of Heating." The bulletin illustrates and describes various applications of this method for the heating of industrial buildings. Bulletin No. 10401, "Sirocco Forced Draft Fans for Domestic Heating Plants."

TUNGSTEN CARBIDE TOOLS. Carboloy Co., Inc., 350 Madison Ave., New York City. First issue of a new publication devoted to results obtained by tools made from the new cemented tungsten-carbide alloy known by the trade name "Carboloy." The publication contains much information of value to present and prospective users of the new cutting tools.

FLEXIBLE SHAFT EQUIPMENT. Linick, Green & Reed, Inc., 10 S. Wabash Ave., Chicago, Ill. Catalogue describing flexible shaft equipment for use in reaming, burring, grinding, polishing, engraving, cutting, erasing, hammering, die-casting, diemaking, etc. Over 400 tools are illustrated and described. Many of these are of recently developed designs.

DRILLING MACHINES. Aurora Tool Works, Division of the Oesterlein Machine Co., 3301 Colerain Ave., Cincinnati, Ohio. Catalogue illustrating the details of construction of Aurora upright drilling machines. Complete specifications covering all sizes of these machines, from 20 to 44 inches, are included. The catalogue also shows the new Oesterlein multiple drill head which may be used with Aurora drilling machines.

TURRET LATHES AND AUTOMATIC LATHES. Jones & Lamson Machine Co., Springfield, Vt. Booklet entitled "The Proper Machine for the Job," calling attention to the uses of turret lathes and automatic lathes in up-to-date production methods. The booklet is accompanied by a number of large halftone illustrations showing specific classes of work for which the various machines illustrated have been used to advantage.